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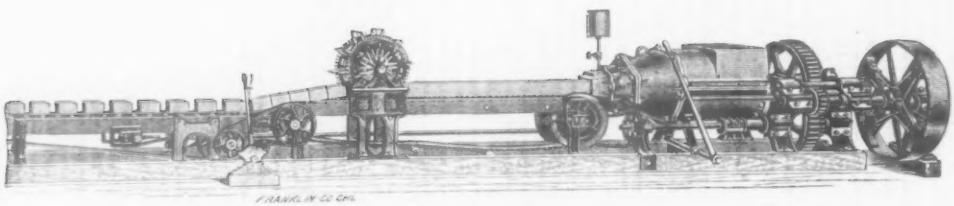

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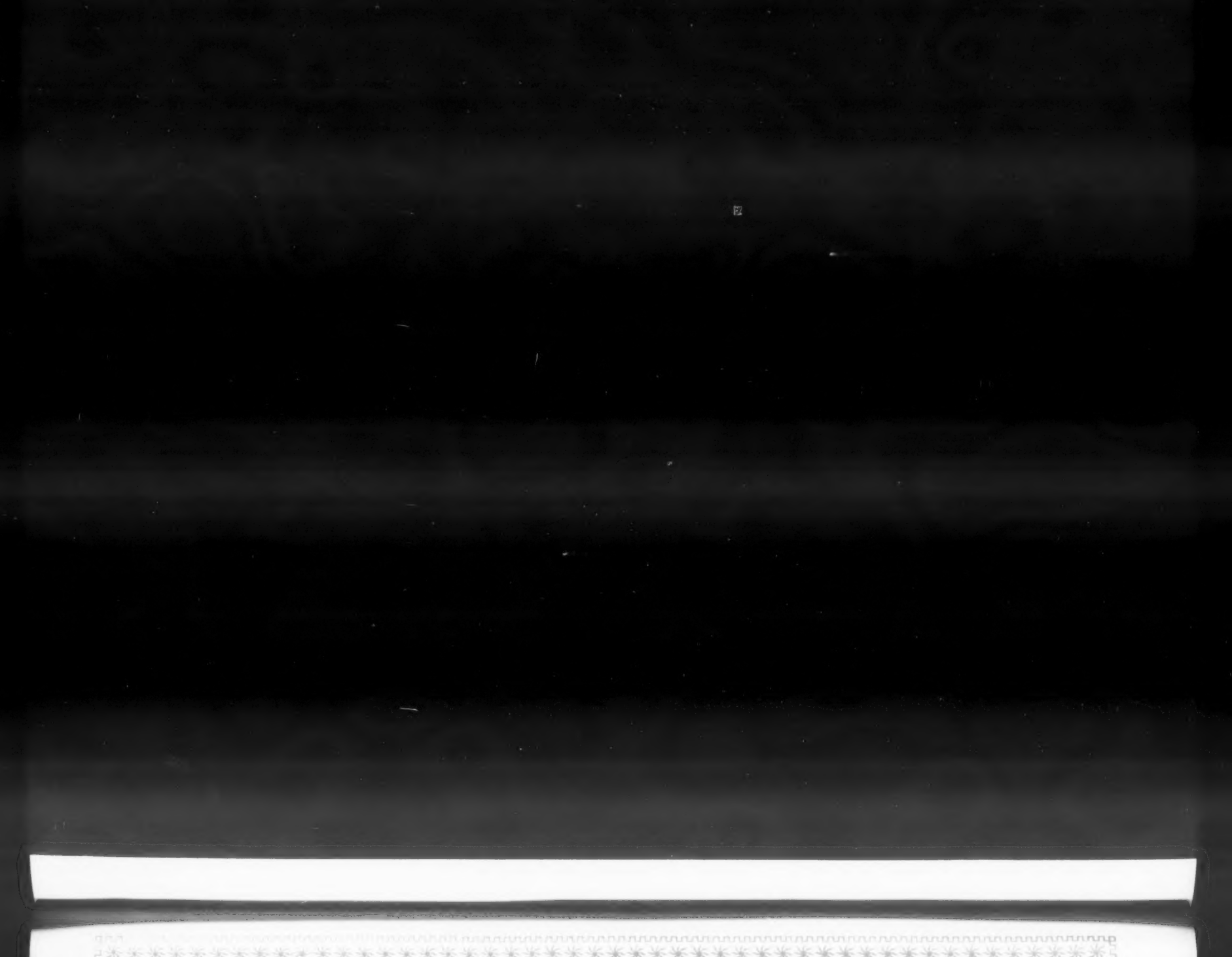

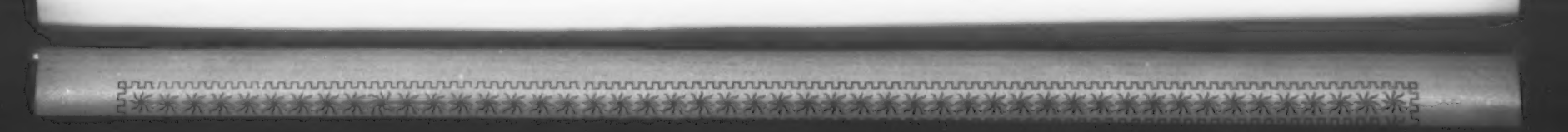

Paving and Municipal Engineering

VOLUME X. MAY, EIGHTEEN NINETY-SIX. NUMBER 5.

THE PAVEMENTS OF AN AUSTRALIAN CITY.

By F. A. Campbell, C. E., F. R. G. S.

MELBOURNE, the capital of Victoria, is one of the best paved cities in the world.

The main streets are ninety-nine feet wide, those of lesser importance sixty-six or thirty-three feet, and they are paved in three different ways—with bluestone metal, stone or wood blocks. The first method of construction applies to the secondary streets in the city, and also all those lying outside the central part of the town. These metaled roadways are well made and carefully kept in order. The metal used is a durable basalt, which abounds in the vicinity of the metropolis. That for road metal is obtained from the corporation quarry, about three miles out to the northeast. It has been worked for eighteen years continuously and now forms a vast excavation. It is over 100 feet deep and extends over a large area of ground. At the faces now being worked, the holes for the explosives are made by a steam rock drill, the steam being conveyed by pipes from the boiler in the buildings above. Rach-a-roch and gunpowder are used as explosives in about equal proportions, and after the blasting is done the broken material is attacked by a small army of men with heavy spalling hammers, who break it up to the required size and load it into the trucks.

The trucks when filled are drawn to the foot of the incline leading up to the buildings on the ground above, in which are the crushing machines. The trucks are drawn up by a wire rope, worked by a winding engine, and are tipped sideways on to a wooded platform in front of the crushers. There are six of these machines in a row, Hope's patent, and the stone is fed into them by men. After passing through the machines the broken material is elevated to

the top of the building by a band elevator, which empties its load into a cylindrical screen, with three different sized perforations in its length. This separates the crushed material into three different sorts, the largest being 2½-inch metal, which slides into a bin and can be loaded straightway into drays by lifting an iron grating. The other is about three-quarter-inch stuff, used both for topping metal and, when tarred, for foot paths. The smallest varies from

A Street in Melbourne, 99 Feet Wide, Metaled with Flagged Pathways.

dust to pieces one-quarter inch in size, and is used for the final layer in road making, and, when tarred, for topping foot paths. The tarring of these screenings is carried on in a very systematic fashion. From the screen they pass by a shoot to a horizontal belt which, provided with wide teeth, draws it slowly along a wooden race, formed on the upper side of a long, narrow box, heated by steam, the object being thoroughly to dry the material before it is mixed with the tar. It is finally drawn into a wooden hopper

which leads into the mixer. The mixer is a horizontal, iron-cased, auger pug-mill, having the screenings and the tar (also previously heated) led into it at one end. The attendant can regulate the admission of either, and gives the stuff as it is delivered a final mixing on an iron floor with a shovel. It is then stacked near the delivery door, from which it can be shot down into the drays.

The whole plant is very complete, is in capital order and the

Melbourne Corporation Quarry.

work very economically managed. The total cost of quarrying, crushing and delivering into the bins ready for the drays is 2s. 10½d. per cubic yard, one-third of which is screenings, estimated to be worth 4s. 6d. per cubic yard. Thus the cost of the metal is not more than 2s. per cubic yard.

The cost of carting and spreading varies according to the distance from 1s. 3d. to 1s. 7d. per yard. Binding, rolling and water-

ing will come to 6d. more, so that a six-inch layer over a Melbourne street costs only 8d. to 9d. per superficial yard. This must be considered most satisfactory, especially when the hard and durable nature of the material is taken into account.

In the construction of the macadamized roads, the bed is first carefully formed to the required cross-section. The old excessive rounding from the crown to the side channels has given way to the much more agreeable and safe curvature of one in forty, which is found to be sufficient if the surface be kept in good order. The metal $2\frac{1}{2}$-inch gauge is laid in layers of six inches at a time, each being rolled with a steam roller fifteen tons in weight. When the necessary thickness is obtained, the binding material is spread, consisting of the screenings from the crushers. This, too, is put on in layers, each being well watered and rolled, so that when finished the binding shall not exceed one-sixth of the depth of the metal. The old form of deep channelling which carried off all the storm water, as well as the fluid house refuse, has been replaced in the more important streets by flat channelling, the upper surface of the pitchers continuing the contour of the street up to the curbing. This at intervals is connected with brick sewers beneath, and so is sufficient for the purpose. These sewers, it may be mentioned, are no part of the extensive sewerage scheme now being carried out. They carry fluid matter only and open out into the river Yarra, which stream now acts as the great sewer of the city.

The old, rather costly, style of flagging the footways with stone has, except in the principal streets, given way to a formation of tar and screenings, which has been attended by most satisfactory results. The method of mixing the tar and screenings has already been described. About $1\frac{3}{4}$ yards of tar go to each superficial yard of paving. When the bed of the pathway is graded a layer of $2\frac{1}{2}$-inch tarred metal three inches thick is laid and well rammed, over this a layer of coarse tarred screenings one inch thick is spread, and over this half an inch of fine tarred screenings, being finished with a light coat of sand. Each coat is well rolled as it is laid. The cost of this runs to about two shillings per square yard, and if properly done should last from eight to ten years, and stand the heat of summer without getting soft.

WHY GOOD PAVING IS ESSENTIAL TO THE SUCCESS OF A CITY.*

II.

By J. W. Howard, B. L., C. E.

A CITY is the home of its inhabitants, and needs properly equipped streets as much as a house needs well-floored and clean hallways.

As a financial investment nothing gives more immediate and better returns to a city than smooth, solid, well-paved streets. Aside from the impetus to business and the facility for moving heavy loads, it is wise to attract new citizens to a city, if for nothing more than the money they spend.

The money alone, however, is the least of the benefits accruing to Washington, Paris, New York and other cities which have drawn many people to them. These people have come from cities and towns which practically have no inducements to retain them at home after they have extracted from the place sufficient with which to go elsewhere. Many of these men live in handsome cities with small income, seeking that which satisfies their sense of beauty and pleasure. Nothing attracts and retains citizens and strangers more than handsome, well-paved and properly cleaned streets.

When we consider how comparatively few people own or use carriages or have need of wagons, trucks and drays for conveying goods, we see that a city street must be studied from other standpoints than vehicles only. It is more than a passage for wheels and foot travel.

Streets are open spaces providing circulation of air, letting in light and sunshine, the great natural disinfectants.

Where would the beauty of architecture be without streets to display it? Architecture is one of the elements of a successful city. A handsome building with a disgraceful pavement about it is like a beautiful picture with a broken and soiled frame.

Streets provide places underneath them for sewer, water and gas pipes. Electric lights, telegraphs, telephones, and the numerous

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other conductors which carry the things enjoyed in common, are properly provided for through or under the streets.

Great progress has been made during the past twenty years in the cities of the United States in the matter of pavements. Long struggle, strong opposition and costly experiments have taken water-works, sewers, pavements out of the hands of indifferent and sometimes dishonest men and placed these vital matters under the supervision of men of experience, combined with a proper education and general observation. Such men investigate, tabulate and profit by the accumulated experience of other cities better equipped than their own.

Our streets are used by almost every one almost every day, yet few persons realize that the paving problem is not yet fully solved. What to use and how to use it, in surfacing our streets, has perplexed the mental and financial resources of all cities since men have lived in communities.

A city without pavements can not maintain its economic existence. Goods can not be moved. Progress even on foot is impeded, street cleaning impossible, health of all in danger.

The tendency of pavements for many years in Europe, and for half a generation in America, is toward smoother surfaces and fewer joints.

When Rome was in its glory, its forum and approaches were laid with large, irregular shaped stones, fitted roughly together. The principal public squares and aveuues of modern cities are almost all paved with surfaces as smooth as possible, with the materials used, and impervious to moisture.

It is pleasing to note in this connection the benefits which are due to smooth, quiet pavements of various substances. Special efforts have been successful to lay them around hospitals, schools and churches in many cities of Europe and several in America. The suppression of noise is a great boon.

The introduction of concrete or monolithic foundation has become general; upon this is placed the wearing surface of whatever material, after careful investigation, each city decides to use.

Macadam and telford roadways are not feasible within large cities, although they are desirable in suburbs and small towns. The wear of heavy traffic, and the effect of wet, dry and freezing

weather, disintegrate them rapidly. Under more than the lightest traffic, telford and macadam can not compete in economy when maintained in constant good order, with granite, asphalt, brick, or even wood pavements. They are eminently fitted for use on pleasure drives in parks or elsewhere than on city streets.

Smooth and durable pavements upon the streets of cities encourage the efforts to clean them. The entire neighborhood is influenced to a better appearance. The children which live and play upon the street enjoy a clean and quiet pavement and are much benefited by it. These children gradually become different from those who live near a dirty and noisy roadway.

Experience of the health department of every city has clearly demonstrated that the "plagues" of former centuries and many of the epidemics of our day are largely due either to the lack of pavements or the presence of such faulty ones as are productive of microbes and bacteria. In order to make many streets in London, Paris, New York and elsewhere safer, not only for those who live near them, but also for the city at large, asphalt pavements have been laid upon hundreds of streets in tenement and similar quarters. The surface of such pavements, being without joint, are easily cleaned. They are also flushed, or washed free from germs of all kinds by each rainfall.

Granite pavements are suitable and must be used in many places, although the noise from them and the difficulty of keeping them clean are greater than upon pavements made of asphalt, brick and a few of wood.

Although asphalt paving has been successful for so many years in Europe, and about twenty years in the United States, it is not the only material which has been studied and tried for paving city streets. Asphalt is successful if maintained in good order, and this maintenance is possible by slight constant attention which costs much less than many are led to suppose. With proper attention it has been found that the best asphalt pavements of Europe and America can be maintained for indefinite periods of time in good order at less expense than even granite blocks, when we include the cost of the eventual renewal of the entire granite surface.

Paving bricks are the natural outcome of the impossibility of shaping granite and other stone blocks so that they will have true sides and even surfaces.

Brick pavements indicate the desire on the part of many to retain a block form of pavement. They are successful where laid under strict specifications, properly lived up to, and where an honest city administration and honest contractors meet to do good work. Brick pavements are not successful where poor bricks are used. One of the great difficulties, even for the friends of brick, is to determine poor ones and prevent them from being laid.

Wood paving as generally laid in the cities of the United States is an acknowledged temporary expedient. It finally becomes badly worn and unsanitary, and is steadily replaced by better materials.

J. W. HOWARD.

Several European cities have wood pavements of carefully cut, rectangular blocks laid upon solid concrete foundations. When in good condition (and they are kept so at enormous expense), they are a luxury from the standpoint of a vehicle. They are somewhat objectionable, especially on narrow streets, because unsanitary. They become slightly uneven and are difficult to clean.

It is not the province of this paper to enter into the details of pavements and the methods of putting them together. These points are amply covered by many articles from many pens in PAVING AND MUNICIPAL ENGINEERING. If the reader is convinced that successful paving is needed for a successful city, and if he has received some inspiration to assist to bring this about, the writer rests content.

VIEWS OF MINNEAPOLIS PARKS AND LAKES.

THE parks and lakes of Minneapolis make it, in the summer months, one of the most attractive cities in the United States. Nature has done much for it, and the city has wisely taken steps for the preservation and improvement of its features of natural beauty. While most attractive in summer, these resorts are also made enjoyable places for winter sports, and they add much to the pleasure of life in this beautiful northwestern city.

CREEK IN MINNEHAHA PARK, MINNEAPOLIS.

The park system of Minneapolis embraces Minnehaha park, with the famous Minnehaha falls, Loring park, Lake of the Isles, Lake Calhoun, Lake Harriett, Lyndale park, the Interlachen driveway, King's highway, Powderhorn, Columbia, Windom, Van Cleve, Riverside, Elliott, Fairview and Glen Gale parks, views of some of which are published in this number of PAVING AND MUNICIPAL ENGINEERING. The system is under the supervision of Mr. Frank H. Nutter, the landscape architect, and the commission in charge is composed of William W. Folwell, president; Herman J. Dahn, vice-president; Charles L. Gove, secretary; Andrew C. Haugan, treasurer; William M. Berry, superintendent, and Patrick Ryan, Jacob Stoft, Abraham S. Adams, Harry W. Jones, Wallace G. Nye, J. Arthur Ridgeway, Samuel Hunter, Chas. H. Woods and Portius C. Deming, commissioners. A report which has just been published reviews the work done during the last year in improving and beautifying the system.

President Folwell, referring to the original plan of Mr. H. W. S. Cleveland, who said that he "would have the whole city a work of art," urges that this should be the aim in developing the city, and adds: "Minneapolis is already widely praised as a beautiful city. May we not wisely adopt as a principle that by all means public and private Minneapolis shall be, and ever continue to be, known throughout the world as the Beautiful City, and taking the lowest ground, let me ask, is there not more money for our city in such a policy than any other? Beauty is the result of shaping and arranging materials—and good shaping costs no more than bad. The bottom meaning of the word 'art' is simply 'fitness.'"

THE CHEMICAL RELATIONS OF ASPHALTUM.

By Prof. S. F. Peckham.

IN recent correspondence the manager of an asphalt property remarked: "Unfortunately the statements of chemists have been so much called in question that practical men are apt to treat such reports with levity and indifference." If this statement is correct there must be a reason for it which a careful examination of the subject will reveal. I propose, in a series of articles, to lay

before your readers a resumè of the work that has been done up to this time in this field of research and to show along what lines it is plainly evident the efforts of chemists should be directed.

There is much confusion at the present time respecting the definition and use of the words asphaltum and asphalt. The word asphaltum is the Latin form of the Greek word *asphaltos*, which is said to be derived from *a*, privitive, and *sphallo*, I cause to slip. It therefore originally signified a substance that prevents one from slipping. Any one who has visited a region where asphaltum occurs as a natural product will readily appreciate the fitness of the name thus given to the exceedingly viscous mineral substances which, when softened in the sun, become attached to everthing with which they are brought into close contact.

From the earliest mention of the substance, in Greek and Roman literature, to within what is termed the modern period, the typical asphaltum of commerce has been the solid bitumen found in the neighborhood of the Dead Sea. In later years, as the knowledge of mankind has extended, not only respecting the surface and extent of the surface of the earth, but also respecting the things found in and upon that surface, the word has been used to designate a number of substances that may be arranged in a series, the members of which differ but slightly in those closely related, but very widely in the extremes. The confusion arising from this cause has been of slow growth, and has led to inconvenience only within comparatively recent years.

In the English translation of Bœrhaave's Chemistry, published in London in 1732, which was a classic in its time, asphaltum, with other forms of bitumen, is classed as a variety of sulphur. While within the present century these substances are no longer associated, there is still a great lack of clearness that arises from the inability of many writers to appreciate the differences that exist between the substances with which they are locally familiar, and other similar, but in many respects quite different materials found in other localities. There is, too, a disposition to name any solid mineral containing bitumen, asphaltum or asphalt, without regard to either the kind or amount of impurities with which the bitumen is associated.

Another source of confusion arises from the fact that for vari-

THE DRIVEWAY ALONG LAKE CALHOUN, MINNEAPOLIS.

ous reasons those substances more or less closely allied to the natural solid bitumens that have been obtained as by-products from many technological processes, have been named and described as asphaltum or artificial asphaltum or asphalt.

Still another source of confusion has arisen from the use of the word *pitch* as an equivalent for asphaltum. This word comes down through all the languages of modern Europe from an unknown antiquity, and has always been used to designate the tarry or resinous residuum obtained by boiling down or distilling the turpentines of coniferous trees. It is a vegetable substance originally. The term *mineral pitch* was applied to the purer forms of asphaltum that resembled in appearance the black pitch of the apothecaries. The Germans also used the term "glance pitch" to designate those very pure and hard varieties of asphaltum that break with a brilliant, glistening fracture, resembling in appearance obsidian more nearly than the ordinary and less pure varieties of asphalt. This use of the word pitch, specialized as mineral pitch, as equivalent to asphaltum, while having little to recommend it, was not particularly objectionable until it became gradually extended to a great variety of substances, the same by-products of numerous technical operations alluded to above. These artificial by-products have also been called artificial asphaltums and asphalts, and in some instances artificial bitumens. They are solid residuums obtained from the distillation, usually destructive, of coal tar, blast-furnace tar, coke-oven tar, candle tar, California petroleum, maltha, etc.

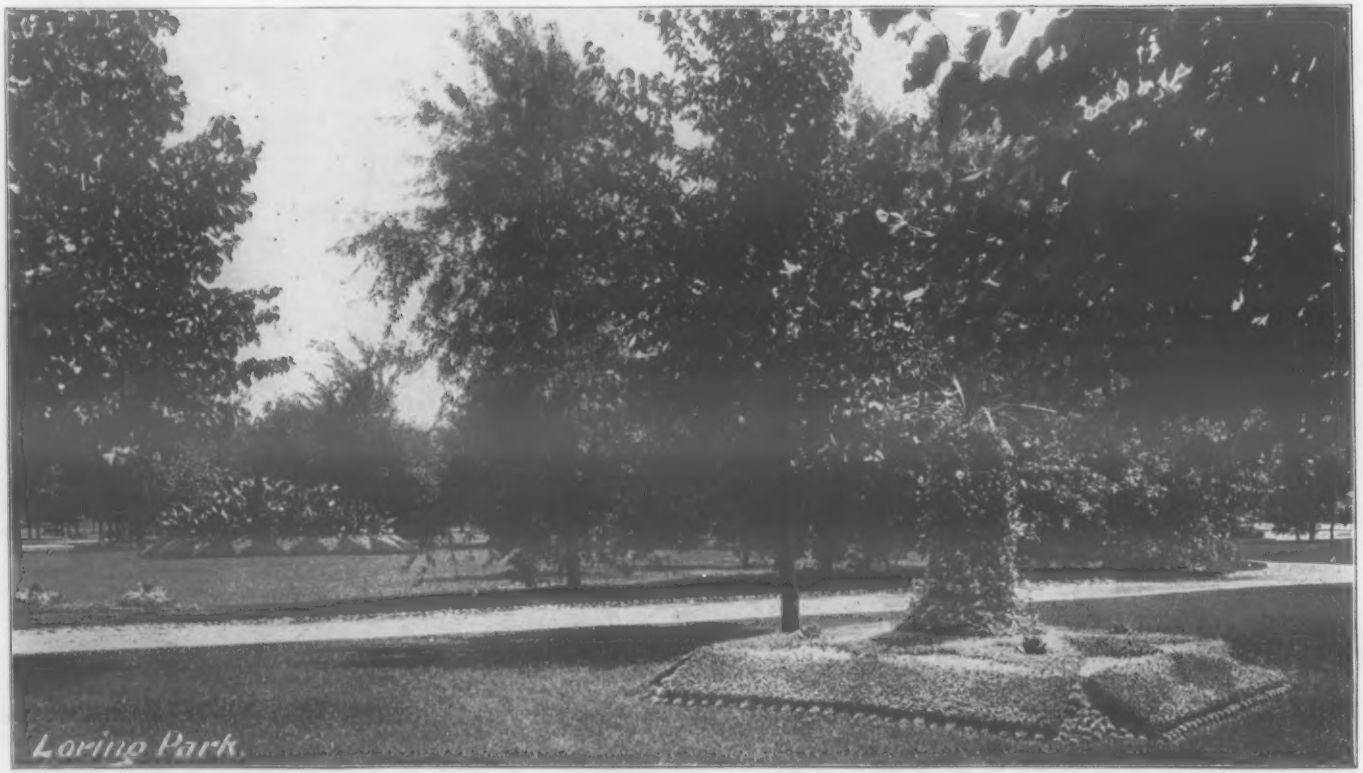
In a work which M. Leon Malo published many years ago he set forth the relation of bitumens to those materials occurring in nature which yield, by destructive distillation, substances resembling bitumens, in a table, which he denominated, "Tableau Synoptique der Matieres Bitumineuses." Many persons, not fully informed upon the subject, have misunderstood this work of a very eminent authority upon bitumens, to be a general classification of all these very unlike substances, as different forms of bitumen. A careful examination of M. Malo's table, will show that it is simply relation, and not identity, that is intended to be set forth in this manner, and for this purpose the table is extremely valuable. The late Dr. T. Sterry Hunt, as long ago as 1863, separated pyrobituminous from bituminous minerals, or more strictly speaking,

A Roadway in Minnehaha Park, Minneapolis.

pyrobitumens from bitumens. The fundamental principle underlying this distinction exists in the fact that "pyrobitumens," that is, coals, schists and shales, on being heated to destructive distillation, yield products that resemble bitumens. Why this clearly scientific, wholly reasonable, and very convenient basis of classification has not been made the foundation upon which all scientific discussion relating to bitumens proceeds, is difficult of explanation. Yet, until this distinction is fully recognized, M. Malo's table will continue to be misunderstood, and writers will continue to mix up bituminous coals, schists of Antun, boghead mineral, etc., with all sorts of bitumens, to the infinite confusion of the discussion of bitumens. These coals, schists and shales are nearly as insoluble in the solvents of bitumen, viz., ethyl ether, chloroform, benzole, etc., as they are in distilled water; hence, Dr. Hunt made the action of these solvents exclusive of the two classes of substances. All true bitumens are miscible with, or almost wholly soluble in chloroform, a test that clearly separates them from pyrobitumens.

On the other hand the true, natural bitumens are not as readily to be distinguished as pyrobitumens from the pitches or artificial bitumens so-called, as the latter generally dissolve in the same menstrua with equal facility. They are however, clearly to be distinguished by chemical tests and are in no manner equivalent to each other. The artificial bitumens so-called, possess far less chemical stability in the atmosphere than true bitumens.

It is further to be observed "that there are a large number of minerals, consisting in part of true bitumens, that are, strictly speaking, rocks. To this class of substances belong the bituminous sandstones and limestones of the upper valley of the Rhone, the Limmer and Ragusa rocks, the Niagara limestone of Chicago, the bituminous limestones of Utah, the Turrellite of Texas, the sandstones of Kentucky, the Indian Territory, the Athabasca river, and California. These are found as beds of sedimentary rock, often of immense extent and thickness, impregnated with bitumen of varying consistency and quality, sometimes nearly fluid, but never solid, after being separated from the rock. In some instances the bitumen appears to be convertible into solid asphaltum, and in others not. The French writers have called these rocks 'asphalte,' but unfortunately they have also called asphaltum



A Floral Feature of Loring Park, Minneapolis.

by the same name, as if the things were identical and the words synonymous." This word "asphalte" might be generally used with advantage in all modern languages to designate these bituminous rocks, qualifying the sandstones as siliceous and the limestones as calcareous.

PROF. S. F. PECKHAM.

As I have elsewhere suggested, the peculiar bituminous mineral found in and around the celebrated Pitch Lake of Trinidad, can hardly be classed with any other material, even when regarded without reference to the relation which the bitumen which it contains holds to other bitumens. It is neither *asphalte* nor *asphaltum*. I have suggested for it the name Parianite as designating the thing by itself.

Excluding, therefore, pyrobitumens and the so-called artificial bitumens obtained from them, otherwise called pitches, and we have left, the true bitumens, which include in the solid form, in different degrees of purity, Parianite, asphaltums and asphaltes.

A RAPID METHOD OF APPORTIONING COST OF PRIVATE STREET WORKS.

By Thomas Caink, A. M. I. C. E., City Engineer and Surveyor of Worcester, England, in London Surveyor.

WHEN assistant to his late chief, it was part of the duties of the writer to deal with the private street improvements which were carried out from time to time by the city council.

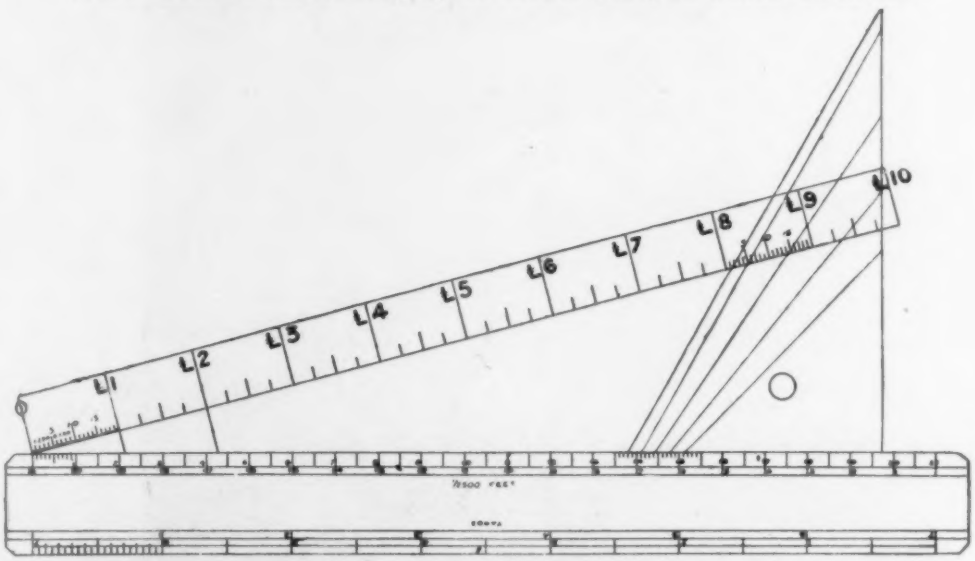
On the completion of any such works an apportionment of the cost had to be prepared, and as the office in which the author was engaged was, like most municipal offices, not over-staffed, it was necessary to adopt means for getting through the work of the office as expeditiously as possible without sacrificing accuracy or efficiency.

The time occupied in computing the cost to be charged to the

NEAR THE ENTRANCE OF MINNEHAHA PARK, MINNEAPOLIS.

various abutting owners, where the number of the premises was large, the writer at first found very considerable, but after adopting various methods for expediting the process he devised a simple mode by which, practically without any calculation, the apportionment could be prepared in a fraction of the time required by the usual methods of computation.

As the instrument can be made by any draughtsman, the writer thinks there may be town surveyors who, desirous of reducing the time of the office expended in this work, may welcome such a device. It consists (as used by the writer) of a sheet of good cardboard about 30 inches long by 15 inches wide, on which is drawn a



scale of £ *s*. *d*. (which can be changed to dollars and cents), several ordinary scales of different degrees of openness, and a rather large set square, the transparent kind being preferable.

The other scales which the writer obtained (which are of boxwood) are four in number, 30 inches in length, divided with a different scale on each edge, making eight scales in all. They are as follows: 1-500th yards, 1-500th feet, 1-2,500th yards, 1-2,500th feet, two chains to an inch, with corresponding feet on opposite edge, and one chain to an inch, with corresponding feet.

There is no need for so many scales, but these were selected as

RIVERSIDE PARK, MINNEAPOLIS.

being of general usefulness in the office, and at the same time as giving ample range to meet every case.

The manner of using the scales is as follows: Having ascertained the total cost of the work and the total length of the numerous frontages (which is most conveniently measured in yards and decimals), it is manifest that if a scale of length can be found on which, when laid along the money scale, the total length of frontage coincides with the total cost of the work of the scale of £ *s. d.*, then every other length will coincide with the cost of that length, and the sum due in respect of each of the various frontages can be read off directly from the scales. This is the simplest case that can happen, but one which hardly ever occurs.

A scale, however, can be selected out of those mentioned on which the total frontage will *approximate* to the total cost. Having found such a scale, place its zero point upon that of the money scale, and lay a set square against the edge of the former (as shown in sketch) in such a position that one of its angles or corners touches the ascertained total length, then place the scales at such angle with the £ *s. d.* ($ c.) scale (by moving it to and fro upon the zero point at a pivot) that the edge of the set square just cuts the total cost upon the money scale. The two scales are then retained in position by two or three lead weights. The cost of the work in respect of the various frontages is then ascertained by sliding the set square along the edge of the boxwood scale and setting the angle at the points thereon corresponding to the lengths of the various frontages. It will be found that the edge of the set square cuts the money scale at sums proportional to the various lengths.

In practice it will be found that the total cost and frontage usually exceed the length of the scales. In such cases it is only necessary to divide cost and length by such a common number as will bring the quotient within the range of the scales and treat the quotients as though they were totals.

It is important that the corners of the set square be kept sharp, so as fairly to touch the wood scale. It is better, however, to use a transparent set square and scribe a line across it on the under side; a number of lines at various angles will be found convenient, being careful, however, to observe the same line throughout the same apportionment. The scribed line removes any difficulty

in accurately placing the set square to the point on scale of length which may arise in course of time from the rounding of the corners of the set square.

By using a magnifying glass great accuracy can be obtained by the above method, while the time occupied in making an apportionment is a small fraction of that necessitated by calculation. The writer has used it for the past five or six years and has found it exceedingly useful.

NEW FORMULA FOR THE FLOW IN SEWERS AND WATER MAINS.

*By W. S. Crimp and C. E. Bruges.**

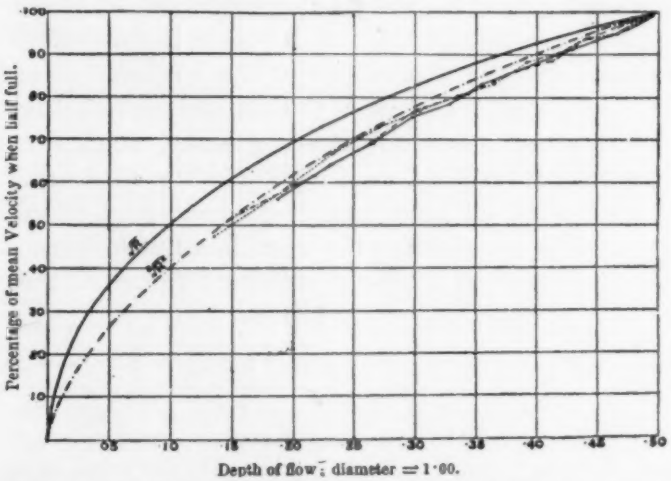
THE fundamental formula relating to the flow of liquids in channels is that of Chezy, in which $v=c\sqrt{r\,s}$, where v is the mean velocity in feet per second, r is the hydraulic mean depth, s is the surface inclination, and c is a coefficient. In this formula the frictional resistances are supposed to be proportional to $\sqrt{r}$, although recent research has shown that the resistances are not proportional to that power of r, but to other powers which depend upon the roughness of the wetted surface and upon other factors. This has been met in some later formulas by giving to the coefficient c a variable value, usually involving r, while the $\sqrt{r}$ is retained in the formula.

The authors have endeavored to construct a simple formula with only one coefficient for all sizes of channels, if of good brick work or of cast iron, which should be sufficiently accurate for every practical purpose and yet should give results closely approximating to those obtained by the use of the more elaborate formulas of Messrs. Darcy and Bazin, and of Messrs. Ganquillet and Kutter. This was found to be not difficult when once the square root of the hydraulic mean depth as a measure of fractional resistance was abandoned and some other power of r was substituted for it.

In determining the influence of the hydraulic mean depth on the mean velocity, it is necessary to have a complete series of experiments under precisely similar conditions as regard inclination

*Proc. Inst. C. E., London, Vol. CXXII.

and roughness of surface with varying values of r. In order to obtain a suitable power of r the authors plotted a series of experiments, by Messrs. Darcy and Bazin, on semi-circular channels having a gradient of 1 in 666.67. In the same figure are also plotted two curves, one involving $\sqrt{r}$ and the other $\sqrt[3]{r^2}$, from which it is apparent that, as a measure of frictional resistance, the latter function so nearly approaches the experimental results that it may be adopted as the base of a new formula. The authors prepared a series of diagrams to show that plotting the formula $c \sqrt[3]{r^2} \sqrt{s}$, with a suitable constant coefficient c, a curve is produced which



Experiments of Darcy and Bazin on semi-circular channels at various depths of flow, reduced to show the percentage of the mean velocity when half full, and showing comparison with formulas based on $\sqrt{R}$, and those based on $\sqrt[3]{R^2}$.

compares favorably with those plotted from the formulas of the best authorities. Before deciding upon a value for c in the formula proposed, the authors plotted a number of trial curves and finally adopted 124, because it was found to give a very close approximation to the curves of Darcy's and of Kutter's formulas for channels constructed of materials like those under consideration.

The author's formula, proposed for application to sewers and iron water pipes, is:

$$v = 124 \sqrt[3]{r^2} \sqrt{s}.$$

A closer approximation might be obtained by the adoption of another coefficient with a different power of s; but as for every day

use it is advantageous to possess a formula which can be employed without reference to tables, the authors prefer the simple form given.

Details of a number of experiments conducted by Mr. Crimp are given. In conclusion the authors say that so far as the materials mentioned are concerned, calculations by the proposed formula will give trustworthy results, erring, if at all, on the side of safety.

SPECIFICATIONS FOR ROAD-MAKING.

THE Massachusetts Highway Commission has adopted new specifications for the improvement of the state highways. The work is to be done under the supervision of the engineer, in accordance with the specifications, and with the plans signed by the commissioners and the engineer. All clearing and grubbing, excavation and embankment, leveling, grading, surfacing, masonry, culverts, fencing, furnishing all materials, implements and labor, clearing away all rubbish, and leaving the work in a finished and neat conditon, will be required of the contractor. Some of the requirements of the specifications are as follows:

Earthwork.—The roadbed shall be graded for the width of —— feet, true to the levels given, and in conformity with the plans, sections and profiles, the surface to be raised —— inches higher in the center than at the sides, for its proper drainage. On each side shall be prepared ditches or gutters (with outlets for the water where directed by the engineer), of such width and depth as the engineer may direct.

All clay and spongy material shall be removed to a depth to be determined upon by the engineer, and the space refilled with gravel or coarse stone. Gravel or stone to be paid for by the cubic yard, when obtained outside of the roadbed excavation.

Material of proper quality, excavated from the line of the road or from borrow-pits, approved by the Engineer for that purpose, shall be used for forming the roadbed, for building embankments, and generally for making all filling and grading that may be found necessary.

The top soil is to be removed from the surface of the road where necessary. All trees, stumps, and roots in the course of the work shall be grubbed up and removed.

The embankment shall be formed of successive layers of not more than 12 inches in thickness, each layer to be thoroughly rolled by a roller weighing not less than two tons.

All surfaces and slopes in excavations, in the borrow-pits or on the embankments, shall be left with neat and even surfaces. All slopes in embankments to be covered with loam from the excavations when possible.

Rock Excavation.—Only such ledge as requires blasting for its removal, and boulders of one cubic yard or more in volume, will be estimated as rock excavation. No allowance for ledge excavation shall be made outside of or below the lines indicated on the sections.

Rubble Masonry (Dry).—This class of masonry will be used for culverts, except upon exposed faces, and for retaining walls.

It shall be composed of quarry stones, presenting good beds for material of this kind, of suitable sizes and shapes for the work, properly breaking joints, and with headers to make well-bonded work, spalls to be used only when absolutely needed for leveling up or pinning; large stones are to be used for foundation courses and for the heads and faces of culverts.

The covering stones of culverts are to be not less than 12 inches thick, laid close together, with cracks thoroughly closed with pinners.

The ends of culverts shall be laid parallel to the center line of the broken stone. The walls shall be of coursed rubble, breaking joints at least one foot, and to have no "pinners" on the face, joints not to exceed one inch. The wall is to be capped with coping stones one foot thick, and at least two feet wide.

Rubble Masonry (Laid in Cement).—All stone used in the work shall be free from structural defects. The mortar shall be made of one part of American cement, two parts of coarse, clean, sharp sand, free from loam and pebbles, mixed in such quantities as to insure its use very soon after mixing. Any mortar not used within three-quarters of an hour after mixing with water shall be rejected.

The cement used must be made by manufacturers of established reputation, must be fresh, very finely ground, and put up in well-made casks. It will be subject to inspection and rigorous tests, and if found of improper quality must be immediately removed from the work. The contractor shall, at all times, keep in store, at the site of the work, a sufficient quantity of the cement to allow ample time for the tests to be made without delay to the work of construction.

All cement must be so stored as to keep it dry, and each cask, as stored, must be raised several inches above the ground, by blocking or otherwise.

Fencing Used as Guard Rails.—At culverts iron rods 1 inch square shall be used, set in the coping stone at least 4 inches.

Fencing shall be placed on the edges of embankments and at such other places along the road as the engineer may deem necessary. The posts shall be of sound, straight chestnut or cedar, not less than 6 inches diameter, spaced 8 feet apart, squared at the butt, and set plumb in straight lines, 3 feet into the ground, and 3½ feet above the ground, and the backfilling thoroughly tamped. All bark shall be removed before setting. The top rails shall be 4 inches square spruce, planed. The side rail shall be 2 x 6 inches straight-grained spruce, planed, free from loose or unsound knots, and both top and side rail shall be notched into and securely fastened to the posts. All parts of the exposed surface of the fence shall be painted with two coats of the best lead and linseed oil paints, of such color as the engineer may direct.

Shaping Surface for Broken Stone.—Before the broken stone is spread, the roadbed shall be shaped to a true surface and rolled by a steam roller unless otherwise ordered. All depressions occurring must be filled and again rolled until the surface is smooth and hard.

Broken Stone (To be used on roads with heavy traffic, or where, in the opinion of the engineer, the stone is not of proper hardness).—On the roadbed, prepared

as hereinbefore specified, the width of the broken stone shall be — feet. There shall be a layer of broken stones, not larger than 2½ nor smaller than ½ inch in their largest diameters, rolled to a thickness of 3 inches. The surface shall be left true and even, and conforming to the surface of the proposed finished roadway, and 3 inches below the grade, as shown on the profile. On this shall be laid a similar layer of broken stone, rolled to a thickness of 3 inches in the middle, and 2 inches on the sides. The whole surface shall then be rolled until the stone is thoroughly consolidated and left true and even, conforming to the cross-section and grade shown on plans. Screenings from the crusher that will pass through a ½ inch mesh shall then be laid on, watered and rolled until the mud shall flush to the surface. Care must be taken to lay on just enough of the screenings to cover the large stone. All rolling on the broken stone must be done by a steam roller of such weight and dimensions as shall be approved by the engineer.

Broken Stone (To be used on roads where the traffic is light, or where, in the opinion of the engineer, the stone is sufficiently hard).—On the roadbed, prepared as hereinbefore specified, the width of the broken stone shall be — feet. There shall be a layer of broken stone, not larger than 2½ inches, nor smaller than 1¼ inches in their largest diameters, the same to be rolled to a thickness of — inches in the middle, and — inches on the sides of the roadway. The surface shall be left true and even and conforming to the surface of the proposed finished roadway, and 2 inches below the grade as shown on the profile. There shall be laid on a layer of broken stones not larger than 1¼ inches, nor smaller than ½ inch in their largest diameter, to a depth of 2 inches. The whole surface shall then be rolled and treated as before specified.

Telford.—On the sub-grade a foundation shall be made of sound, hard stones 4 inches to 10 inches in width, 6 to 20 inches in length, and not less than 8 inches in depth. They shall be placed by hand, vertically, on the broadest edges and lengthwise across the roadway, so as to form a close, firm pavement; they shall be bound by inserting and driving down, in all places where practicable, stones of proper size and shape to wedge them in their proper position; all projections of the foundations above grade shall be broken off by hand and driven into the spaces, and wedging stones shall be furnished and driven until the foundation shall be full to grade. The foundation shall then be thoroughly rolled; the sub-grade given will be paralled to the proposed finished grade, and — inches below it.

Gravel Foundation.—In all places when it becomes necessary to remove the existing soil, or in places where it shall be deemed necessary to secure a good foundation, suitable gravel shall be spread over the roadway to a depth directed by the engineer; the same to be properly shaped and thoroughly rolled before placing any stone on same.

Vitrified Clay Pipe (for Culverts).—All pipes shall be first quality, salt glazed, free from blisters and cracks, straight and round, and laid true to the lines and grades furnished by the engineer. Nothing but selected fine material, free from large stones, shall be placed under or around the pipe, and all material placed under and about the pipe shall be thoroughly tamped in place by a thin iron tamping bar. All joints shall be made of first-quality American cement mortar, carefully filled in all around the pipe.

Drains.—The trench shall be excavated not less than 2½ feet below the sub-grade, and not less than 12 inches wide at bottom and 15 inches wide at top. At

least 3 inches of gravel shall be placed in the bottom of the trench. On this shall be placed salt glazed, vitrified drain pipe, — inches in diameter, with bell and spigot joints laid with open joints unless otherwise ordered; the trench will then be filled to a point 6 inches above the drain pipe with gravel that will pass through a 1-inch mesh and not through a ¼-inch mesh; the balance of the trench shall be filled with stone which will go through a 3-inch mesh and not through a 1-inch mesh.

Finishing Between Limits.—All stones less than half a cubic yard in size, appearing on the surface within the limits of the location of the road, shall be removed. All rubbish shall be removed from within the limits of the location, and all brush and trees (excepting such as shall be specially exempted by the engineer) shall be grubbed up and burned.

Where directed by the engineer the contractor shall plow, harrow, brush and seed with grass seed all unused portions of the location other than the slopes, and shall cover all slopes with loam from the excavations and sow the same with grass seed.

Cobble-Stone Gutters.—The stones shall be equal to good hard field stone, not to lay less than 4 square yards, nor more than 6 square yards to the ton. The contractor is to excavate for the gutters to the depth of 12 inches below the finished surface of the gutters. A gravel foundation shall be rammed into a solid layer 4 inches thick. A layer of bedding sand or screened gravel shall be spread over the gravel of a sufficient depth to bring the gutter stones that are bedded in it to the proper grade after they are thoroughly rammed. Each stone shall be rammed to an unyielding foundation and the surface left true and even. The surface shall be covered with sand of sufficient depth to fill all interstices. Selected large stone shall be laid true to a line on the sides and center.

Setting Stone Bounds.—Stone monuments 6 feet long, to be furnished by the commission, shall be set at such points and at such depths as may be designated by the engineer. When the excavation is in spongy earth, gravel, or sand must be furnished by the contractor to be placed about the stone.

General Clauses.—All persons employed in the performance of manual labor under this contract shall not be required to work more than nine hours in each day, and nine hours shall constitute a day's work.

The work is to be commenced within 15 days after the execution of this contract and be diligently prosecuted to completion, in such order as may be prescribed by the engineer.

The contractor is to furnish, free of charge, such temporary structures as may be necessary for maintaining points and lines given by the engineer for the building of the work, and is to give said engineer such facilities and materials for giving said lines and points as he may require; and the engineer's marks must be carefully preserved.

A FAMOUS MAYOR.

A REVIEW in the March number of PAVING AND MUNICIPAL ENGINEERING, of the last annual address of Mayor Pingree, of Detroit, giving his ideas of better municipal management in the interest of the people, with various suggestions as to reforms, attracted much

attention, and has brought many inquiries regarding the man. His aggressive championship of the rights and interests of the people, his uncompromising opposition to corporations seeking or operating under municipal franchises, his political antagonisms, and the unique municipal enterprises and reforms he has inaugurated, have brought him into conspicuous prominence as a man, and he is to-day one of the most widely known city officials in America. He has developed the possibilities of great usefulness in the office of mayor to an extent worthy of the consideration of those who occupy the position in an ornamental or merely perfunctory way. He is denounced by his enemies as a demagogue and often his utterances warrant the charge, but he undoubtedly has a broad and usually a right view of official duty, and his courage in the performance of it is unquestionable. He is a mayor who "does things." He is evidently appreciated by the people of Detroit, for they re-elect him by increasing majorities.

Hazen S. Pingree is a lineal descendant of Moses Pingry, who came from England in 1640, and settled in Ipswich, Mass. For the first one hundred and forty years nearly all of the American branch of the family lived in Ipswich, Rowley and Georgetown, Mass. Toward the close of the last century the family had so increased in number that many of the name sought and obtained new homes in other parts of the Bay State, and in Maine, New Hampshire, Vermont and Nova Scotia, and at the present time, descendents of the family are found in nearly every part of the Union.

HAZEN S. PINGREE.

Hazen S. Pingree was born at Denmark, Maine, August 30, 1842, and is the fourth child of Jasper and Adaline Pingree. His father was a farmer, and resided at Denmark from the time of his birth in 1806 until 1871, when he came to Detroit, where he died in 1882. Hazen S. Pingree

resided with his parents until fourteen years of age, when he went to Hopkinton, Mass., and secured employment in a shoe factory. Here he learned the trade of cutter, at which he worked until August 1, 1862, when he enlisted as a private in Company F, First Massachusetts Regiment of heavy artillery. This regiment was assigned to duty in the Twenty-second Army Corps, and its first service was rendered in defense of the nation's capital. During General Pope's Virginia campaign the regiment was ordered to the front, and participated in the battle of Bull Run on August 30, 1862. It afterwards returned to duty in defense of Washington, and remained there until May 15, 1864, when the time of service of this regiment having expired, Mr. Pingree, with enough others, re-enlisted to keep up the organization of the regiment, which was then assigned to the Second Brigade, Third Division, Second Corps, of the Army of the Potomac, and took part in the battles of Fredricksburgh Road, Harris Farm and Spottsylvania Court House, Cold Harbor, North Anne and South Anne. At the battle of Spottsylvania Court House his regiment opened the engagement, and lost five hundred men, killed and wounded.

On May 25, 1864, Mr. Pingree and a number of his comrades, while reconnoitering, were captured by a squad of men commanded by Colonel Mosby. As prisoners of war they were brought before that rebel officer, who exchanged his entire suit of clothes with Mr. Pingree, but afterwards gave back the coat, remarking that his men might shoot him for a "Yank," a result he certainly did not desire. After his capture, Mr. Pingree was confined for nearly five months at Andersonville, and for short periods was confined at Gordonsville, Va., Salisbury, N. C., and Millen, Ga. At the latter place, in November, 1864, he was exchanged, rejoined his regiment in front of Petersburg, and soon after took part in the expedition to Weldon railroad, and in the battles of Fort Fisher, Boydton Road, Petersburg, Sailor's Creek, Farnsville, and Appomattox Court House. From the battle of the Wilderness to the Fall of Richmond, his regiment lost 1,283 men and 38 officers. It was complimented in special orders by Generals Mott and Pierce, for particular gallantry in the last grand charge on Petersburg, in which it took a leading part. Mr. Pingree's second enlistment was for three years, or the close of the war, and when the surrender of Lee took place, his regiment was in close proximity.

He was mustered out of service on August 16, 1865, and shortly after his discharge he came to Detroit. For a short time he was employed in the boot and shoe factory of H. P. Baldwin & Co.

Deciding to embark in business for himself, in December, 1866, with C. H. Smith, he purchased the small boot and shoe factory of a Mr. Mitchell, the entire capital represented by the firm of Pingree & Smith, then established, being but $1,360. The first year they employed but eight persons, and the value of their production only reached $20,000.

Their venture was a success from the very start, and has shown a steady increase from year to year. For years they have maintained their position as the most extensive boot and shoe manufacturers in the west, and their factory is excelled by but one or two in the United States. Over seven hundred persons are employed, and their weekly pay-roll amounts to between $5,000 and $6,000. The value of their annual products amounts to about $1,000,000. Their sales extend all over the west, but are more especially confined to Ohio, Michigan and the north-western states. From the beginning of this enterprise, Mr. Pingree has had general supervision over the complicated details of the entire establishment. Mr. Smith retired from the firm in 1883, but the firm name, Pingree & Smith, has been retained. Mr. Pingree's success has been the result of hard work and good management.

In 1889 Mr. Pingree was elected mayor of Detroit, defeating the Democratic candidate, John Pridgeon, Jr., who then held the office, by 2,318 majority. As mayor he has made an enviable record. Through his influence the great street-car strike last spring, which practically paralyzed business for a week, was satisfactorily settled. A few months later, when the council attempted to give the street-car companies thirty-year franchises of every line in the city, Mayor Pingree interposed with his veto and effectually killed the scheme, thereby undoubtedly saving to the city of Detroit rights worth millions of dollars.

In the fall of 1891 he was renominated for mayor by the Republicans, and was triumphantly re-elected in one of the most hotly-contested municipal elections that the city has ever experienced. His total vote was more than one thousand higher than the com-

bined vote of the two Democratic candidates. When it is considered that the normal Democratic majority in Detroit is between three and four thousand, Mayor Pingree's strength with the people can be appreciated.

For the third time, in the fall of 1893, Mr. Pingree was called on to make the race for mayor. The odds against him were tremendous. The Democratic leaders had become reconciled to each other and united on one of the most popular Democrats in Detroit to oppose Mr. Pingree. The local-Republican leaders, whose interests Mayor Pingree had antagonized by his vigorous assaults upon monopolistic corporations, such as the street railway company, the gas companies, etc., were united to a man and threw all their wealth and influence to his Democratic opponent, but in spite of all this, the people registered their approval of the policy pursued by Mayor Pingree by re-electing him for the third time with a splendid majority of 6,000.

For the fourth time (in October, 1893), Mayor Pingree was again persuaded to accept the nomination for mayor, which he received unanimously. The opposition built up plans to prevent the re-nomination and enlisted nearly all the wealthy corporations of the city, but succeeded in electing only one delegate for their candidate out of one hundred and eleven, and this one man (an ex-mayor and a state senator in the last legislature), supported the nomination of Mayor Pingree, and cast his vote for him, making it unanimous. The Democratic party nominated an alderman as their candidate for mayor, but Mayor Pingree was re-elected by 10,592 majority.

THE MEN WHO MANAGE THE BARBER ASPHALT PAVING COMPANY.

Of the great companies conducting extensive industries in America, those engaged in the improvement of cities are not only among the most prominent before the public, as subjects of comment, but they bear a relation to municipal progress and public welfare that makes them peculiarly interesting. The most noticeable physical change in American cities during the last quarter of a century—in many it is scarcely a decade—has been in street pavements which have undergone transformation from

a condition that we now look upon as very crude to one closely approaching the ideal qualities. The effect of this improvement in benefiting every related interest and in general advancement—better buildings, the beautifying of adjacent property, more careful attention to public cleanliness and better sanitary conditions, increased comfort, facility and economy in travel, greater prosperity and stimulated appreciation of all that makes better conditions—has marked a great epoch in municipal progress. This has principally proceeded from the companies which have introduced better pavements, and some of them, while attaining great business success, have thus been a large factor in the civilizing influences of the times.

One of the greatest of this class of industries is asphalt paving, which has brought us smooth and impermeable streets. Among the pioneers in this work was the Barber Asphalt Paving Company, which, from a small beginning, has grown to the proportions of one of the greatest business organizations in America, employing thousands of people in the extensive improvement work which it carries forward in many cities. It is the purpose of this article to give some information about the men who manage the vast work of this extensive business organization.

During the first years of its existence, the Barber Asphalt Paving Company had a threefold struggle: First, the selection of proper materials and machinery; second, the obtaining of contracts against the prejudice of officials, the public, and the invested interests of contractors laying granite, trap and even cobblestone pavements; third, the selection of men suitable for certain positions, and the training of men for others.

It was due to the energy and ability of Mr. Amzi Lorenzo Barber that the company was formed and became successful. The present popularity of asphalt pavement doubtless would not have been possible were it not for the organizing and executive ability of this remarkable man. He not only created an industry for the company which bears his name, but also for others who are competitors and rivals. Mr. Barber, who retired from his position as president a few years ago, has promised an article for PAVING AND MUNICIPAL ENGINEERING on his early experience in the business, in connection with which will be published an outline of his life.

The personality of the founder of the company, and that of its president and other officers, permeate its every branch. The company has the reputation of administering its affairs with business and military precision. It is claimed for it that it follows the true policy of all successful enterprises—that of living up to the spirit as well as the letter of its contracts.

COLONEL F. V. GREENE, PRESIDENT.

Colonel F. V. Greene, the president of the company, is an example of success in several kinds of work to which he has devoted his attention. He received an excellent home training in his birthplace, Providence, R. I., being one of the children of Gen. George S. Greene. He was benefited while a youth by contact with active men when visiting his father at intervals during the civil war, in which that father bore so important a part.

Francis Vinton Greene, in 1864, entered Burlington College, New Jersey. He early showed traits of character which soon developed into commendable ambition, ability to listen as well as speak, a facility for analysis of information and search of facts.

He thus laid safe foundations for his opinions. His executive ability enables him to bring about that which he decides to undertake. Study and practice have given him a clear and concise literary style which make his writings very attractive.

General Grant appointed him a cadet at West Point in 1866. Graduating in 1870, at the head of his class, he served two years in the artillery and was then transferred to the engineer corps where, of right, as first in his class, he belonged. The next four years were passed in the practical work of surveying and marking the international boundary along the forty-ninth parallel. This gave the then Lieut. Greene much practical experience in difficult engineering for which he has often proved himself fitted. Then followed a brief assignment to a confidential position under the secretary of war.

His literary tastes were cultivated by much reading and many writings which he began to produce at that time. He was selected in 1877, with the approval of Gen. Sherman, and sent to Russia as military attache, where he arrived on July 18, to accompany the Russian army, with a view to a report upon its operations during the Russo-Turkish war. He passed the remaining nine months of the war with that army and was present at the battles of Shipka, Plevna, Taskossen, Sophia and Philippolis. When the Russian army arrived, February 3, 1878, in front of Constantinople, Lieutenant Greene, during the armistice, rode alone through the Turkish lines into Constantinople, a very hazardous undertaking, considering the prejudice, ignorance and fanaticism of the Turkish soldiers and citizens who, with great difficulty, were persuaded that he was other than a Russian officer.

Notwithstanding his comparative youth at that time, his military bearing, bravery, character and worth were recognized by the Emperor of Russia and the King of Roumania, from whom he received decorations. His report to Gen. Sherman, published under the title of "The Russian Army and its Campaign in Turkey, 1877–78" was so well received that Lieut. Greene was at once recognized both as a clear, concise writer and as the best military critic in the United States at that time.

The next phase of his life was that of municipal engineering, which began in 1879, when he was assigned to duty as assistant

engineer commissioner of the District of Columbia, including, of course, Washington City.

Many readers of this article remember Washington during and at the close of the war, when its streets, if paved at all, were encumbered with cobble-stones, and when many people thought the capital so situated as to preclude ever becoming an attractive permanent place of residence. Many advocated moving the seat of government to some other city.

Just previous to the arrival of Lieut. Greene great efforts were put forward to grade and drain the city. Vast areas of wooden pavements were laid. Almost all of this work had to be redesigned and reconstructed—especially the decayed wooden pavements which encumbered the streets and rendered many of them impassable.

A careful study of the subject of pavements in connection with the other public works of Washington, convinced Capt. Greene (his promotion having occurred in 1883), that Trinidad asphalt pavement, properly laid, possessed on the whole the greatest advantage for a street pavement. He believed it gave the most satisfactory results, regarded from the points of view of comfort, convenience, health, beauty, and economy.

Washington streets, under his administration, soon became the admiration of all, and, in connection with other improvements, have made the capital very attractive—a model.

It is the custom for army officers upon the successful completion of a tour of duty in one place, to be transferred to another, and Capt. Greene was next made instructor of military engineering at West Point, where he served until 1886.

He decided to leave the army and devote his time to civil pursuits. He had made such an exhaustive study of the subject of roadways and pavements that he fully recognized their importance to the health, wealth and prosperity of cities. He acknowledged the lack of good pavements in American cities, except the improvements inaugurated in Washington, Buffalo and a very few other places. He made a tour of the principal cities of America and Europe to study their pavements. He saw no reason to change his convictions of the superiority of the form of pavement laid by the company of which he soon was asked to become vice-president. He saw that there lay before him a career of usefulness and benefit

to the public by introducing smooth, impermeable pavements into American cities. The results have justified his decision.

As vice-president, then president, of the Barber Asphalt Paving Company, Col. Greene has seen city after city awaken from a period of ignorance and apathy to a period of knowledge and interest in asphalt and other efficient pavements.

His title of colonel comes from his being elected colonel of the Seventy-first Regiment National Guard of New York, which he has brought to its present high efficiency.

Col. Greene, with his characteristic application, steadily became familiar with the commercial requirements of a rapidly expanding business. This supplemented his familiarity with the engineering problems involved in successful street paving and fully fitted him for the position of president of the company, to which he was elected in 1892.

Col. Greene is now forty-six years of age. The character of a man is often best understood by learning what he does with his leisure. Col. Greene properly organizes his vast work so that he has a little leisure which he devotes to the improvement of the National Guard, literary work and his family.

Charles K. Robinson, treasurer, who was born in Nashua, N. H., about fifty years ago, was educated in Augusta, Me., where, in addition to the knowledge obtained through study, he acquired those correct habits of life, thought and action which have made so many New England men successful. Like many others with energy and ambition, he found the opportunities of New England too few, and went to California, where he spent seven years gaining a knowledge of men and affairs, together with that self-reliance which absence from home quickly develops in men of worth.

CHARLES K. ROBINSON, TREASURER.

During his absence, his father had established a business of furnishing building materials in Philadelphia, to which point the son turned just subsequent to his father's death. He succeeded to that which his father had established, carried it on successfully for several years, when he became one of the organizers, treasurer and secretary of the Pennsylvania Globe Gas Light Co. The success of this company is well known, especially throughout Pennsylvania. It accomplished the lighting of many towns, villages and country residences which had hither to found no means of enjoying what has become a necessity. This company introduced the methods of improving and cheapening gas by what is well known as the "water gas" process. Among Mr. Robinson's acquaintances were several connected with the Barber Asphalt Paving Co., and, in 1894, upon the retirement of the former treasurer from business, Mr. Robinson was invited to accept this position, to which he was elected.

He is a man who administers his trust with care and precision. While holding the men in his department firmly to their duty he is always courteous and willing to express his appreciation of their efforts in behalf of the company.

Joseph C. Rock, secretary, like many another New England boy, could not be restrained from entering the army in 1861, when, at fourteen years of age, near his birthplace, Northfield, Vt., he entered the Sixth Vermont Regiment. Mr. Rock served faithfully at his posts of duty throughout the war and at its close returned to private life. Mr. Rock's service, however, in the Army of the Potomac was such that in 1865 he was detailed as a soldier for special clerical work in the Bureau of Refugees, Freedmen and Abandoned Lands,

J. C. ROCK, SECRETARY.

where he attracted the attention and gained the honor and respect of Gen. O. O. Howard, who was appointed by President Lincoln to adminster that bureau, which was such a necessity, and accomplished so much at a time of transition between war and peace. Mr. Rock rose to be senior clerk in this bureau, and his services were notably efficient.

When peace returned he again began to study and graduated from the law department of Howard University in 1869. When the first improvements of Washington City began under the board of public works in 1872, Mr. Rock was offered the position of journal clerk of that Board, resigning from his position in the Freedman's Bureau to accept this appointment. The territorial form of government of the District of Columbia being abolished in 1874, Mr. Rock was immediately reappointed senior clerk, this time of the new engineering department under the board of commissioners then established. He was promoted to the chief clerkship of the engineering department of the national capital and the District of Columbia in 1876, and the position has never been better filled than by him. His accumulated experience of seventeen years made him very efficient in connection with the public work of a model city. He became especially familiar with the different kinds of pavements with which Washington had experimented from time to time for many years. He was familiar with the growth and success of asphalt pavement and had gained such confidence in its value that in 1889, when offered the position of secretary of the Barber Asphalt Paving Company, he decided to resign from the prominent official place he occupied and devote his time to the duties of secretary of the company which had gained his admiration and respect. His work shows his administrative ability. He now resides in New York city with his family. Mr. Rock has many acquaintances throughout the United States.

Philip W. Henry, C. E., assistant to the president, holds this important position, to which he was appointed after rapid and well-merited promotion, in 1894, being then in his thirtieth year. Mr. Henry's birth place was Scranton, Pa., although he passed his boyhood in Oxford, N. J., to which place his parents had moved. Beginning in 1880, he had three years' experience in connection with railroad location and construction. He was one of the engineer corps of the D., L. & W. railroad. Starting as an assistant he

served successively as rodman, leveller, and transit man. His work lay at points near Buffalo, Binghamton, Waverly, Bath and Mt. Morris, N. Y. The result of this practical work was his decision to study engineering, for which purpose he entered the Rensselaer Polytechnic Institute, Troy, N. Y., and graduated as a civil engineer in 1887. Mr. Henry is one of those men for whom a position is always ready without solicitation. This is due in a large measure to his thoughtful, reserved manner, coupled with an ability of close concentration upon a matter in hand. He seems to speak only when he has something definite to say. His instructions are given without ostentation and remind one of the manner in which men occupying important positions request rather than order that which they desire accomplished. The many superintendents of cities and other employes, principally of the construction department, who look directly or indirectly to Mr. Henry for instructions, have developed a spirit of respect and affection which gives unusual success to his work.

P. W. HENRY, ASSISTANT TO PRESIDENT.

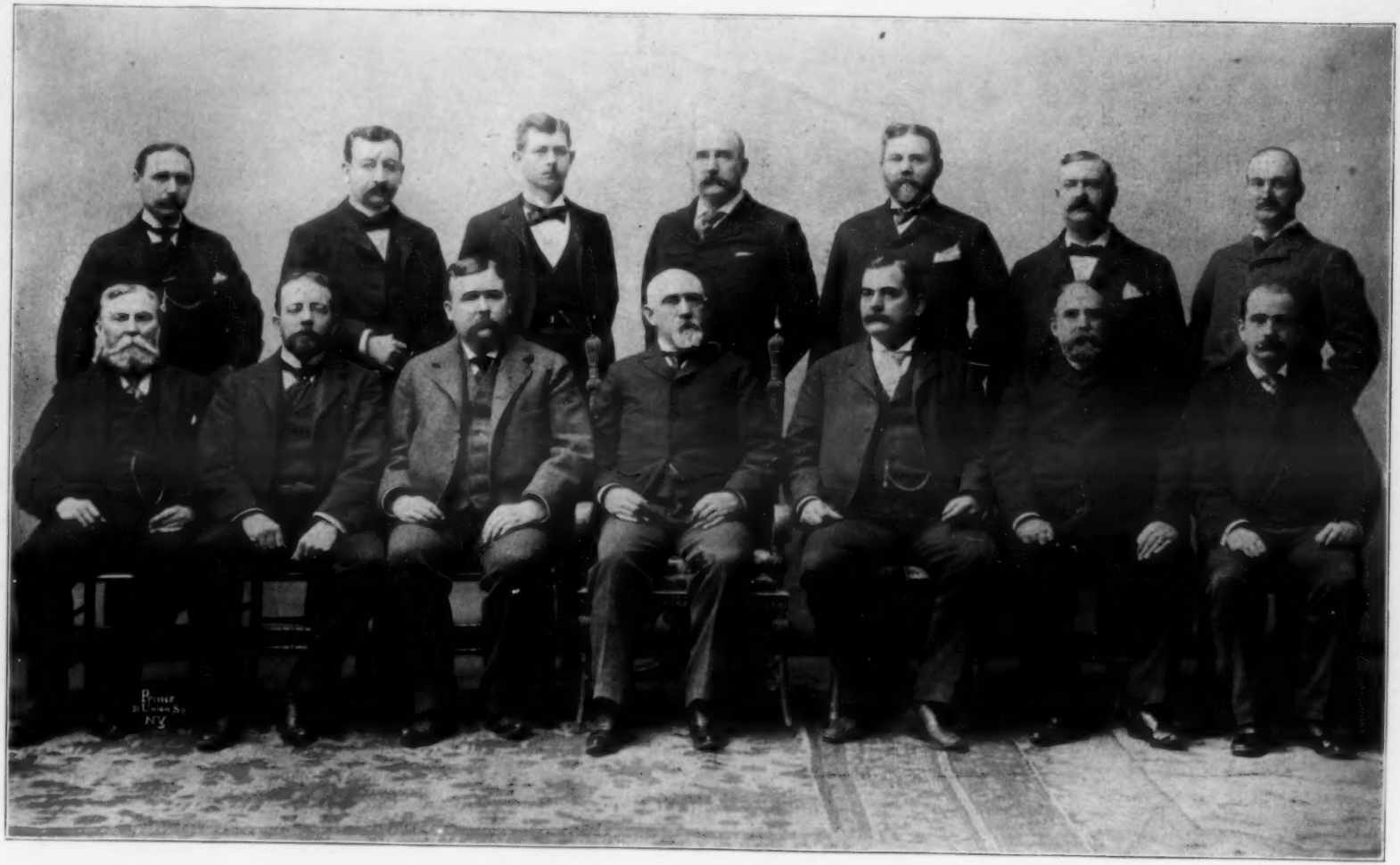
Upon his graduation as a civil engineer he entered the employ of the Barber Asphalt Paving Company as a foreman. He became thus familiar with the practical details of asphalt paving. With the exception of the winter of 1887-88, when superintendent of construction of the water-works at Clinton, Ill., he has been in the constant employ of the Barber Company. His rapid advancement, upon his merits, from assistant superintendent at Buffalo, in 1888, superintendent at St. Joseph, Mo., in 1889, then Omaha, Neb., then of the work at New York city in 1892, were the natural step-

ping stones for the position for which he was unconsciously fitting himself. The position of assistant to the president was created and Mr. Henry selected to fill it in March, 1894. Upon being asked what led him into the asphalt paving business he replied that it was more from accident than design, and that he is very glad that fate took him in that direction. He certainly has many opportu nities to employ his technical training and knowledge of men and materials in connection with the vast business with which he is allied.

Frank Jesup Bristol, assistant secretary, occupies a position upon which, in a large measure, the success of the company depends. Besides the extensive and varied work which he undertakes in co-operation with and as assistant to the secretary, Mr. Bristol has direct charge of the vast recorded experience in connection with the great amount of work which the company has already accomplished. Under the general direction of the president, Mr. Bristol has devised such a system of records as to enable the officers of the company, upon the shortest notice, to read the record of the contract in the past which approximates most closely to a contract sought for, or about to be bid upon. The statistics of asphalt pavements laid in the United States and Canada, of which Mr. Bristol has made acareful study, are undoubtedly most reliable.

F. J. Bristol, Assistant Secretary.

Mr. Bristol is the son of Northern parents who had established themselves previous to the civil war in Charleston, S. C. That war, as in many other cases, compelled his family to temporarily leave the South. His education, therefore, was begun under a private tutor in New York city, continued in an Episcopal school on Staten Island, and then through one of the best New York public schools, he entered the College of the City of New York.



C. W. Wagner. F. L. Hitchcock. Brainard Rorison. Franklin Haines. H. W. Green. H. J. McGowan. A. Brockerhoff. C. E. Squires. E. R. Cox. J. C. Rock. S. C. Lombard. Chas. Harris. C. B. Rhodes. G. M. Furman.

His father having returned to Charleston, naturally desired the assistance of his son, who, anxious to get into business, and glad of an opportunity under a father, went to him there, where he remained several years actively engaged in business.

Continuous residence in the debilitating climate of the South, compelled Mr. Bristol to return again to New York, where he at once entered the banking department of H. B. Claflin & Co. Soon afterward the well-known and old firm of Nathaniel Fisher & Co. offered him a position in their credit department, where Mr. Bristol gained much experience in the value of clearly recorded and properly analyzed accounts.

The Barber Asphalt Paving Company offered Mr. Bristol a position in their general offices, at that time being established at No. 1 Broadway, New York city. He entered upon his duties in April, 1888. Within four years his value as a man who does his work promptly, as well as requiring those who report to him to do the same, was recognized, and on February 17, 1892, he was appointed assistant secretary by the board of directors.

Mr. Bristol, because of the great details of the portion of the company's work under his charge, is compelled to be concise and a man of few words in his office. He is far different, however, either in his suburban home or among his large circle of acquaintances in New York city.

Prof. H. C. Bowen, chemist, enjoys the well-earned reputation of a painstaking investigator and able instructor. A visit to him in the laboratory of Columbia College, New York, reveals a modest, thoughtful, studious man.

PROF. H. C. BOWEN, CHEMIST.

His early education in several schools and graduation from the State Normal School at Albany, gave him a broad foundation upon which to found a special course of chemistry and physics in the school of mines, Columbia College. He supplemented this by two years' university work at Heidelberg and Berlin. He bears the im-

press of Professors Bunsen, Kirschoff, Hofmann and Helmholtz, under whose guidance he came.

During the past eighteenyears Professor Bowen has been instructor in the laboratory of the school of mines, to which position he was called after his return from Germany. His careful analyses and clear records of results greatly benefit the scores of students who pass under his care.

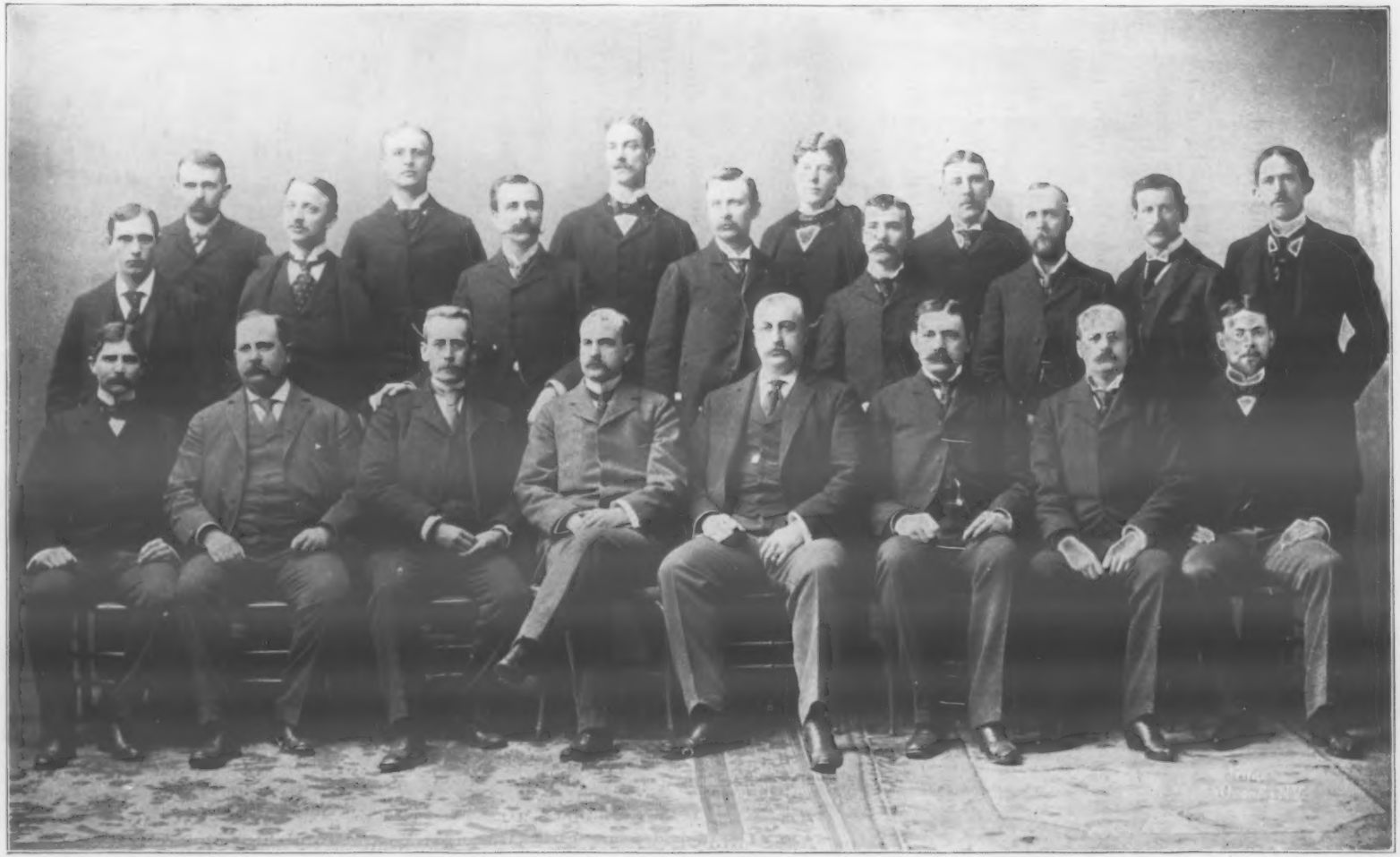
Aside from his educational work he has acted as consulting chemist to several industries, among them that of asphalt paving, which depends so much upon the researches and reports of a chemist who has made the bituminous substances a special study.

Clifford Richardson, superintendent of tests, accepted this important position in January, 1896—a position for which his education, travel and long practical experience in applied chemistry and physics well fitted him. He graduated from Harvard University in 1877, where he devoted a large portion of his study to chemistry.

CLIFFORD RICHARDSON, SUPT. OF TESTS.

A difficult and exact piece of scientific work was that of the researches on the atomic weight of antimony by Prof. J. P. Cook, in which Mr. Richardson took part while engaged for a year as his assistant.

After study in the University of Bonn, Germany, he was engaged in the United States geological surveys in Wyoming and Yellowstone Park. The next nine years were passed as assistant chemist, United States Department of Agriculture. His reputation for precise work in analysis and tests, coupled with a proper tabulation and interpretation of the results, earned for him the position of inspector of asphalts and cements, Engineering Department of the District of Columbia, to which he was appointed in 1887. He resigned in 1894 to open an office as consulting chemist, with special reference to asphalt. He then established a private laboratory in Washington, equipped for making the various



R. C. Ruthven. R. M. Richards. S. C. Scales. A. H. Craney, Jr. Richard Dana.
J. G. Crane. J. B. Traver. J. M. Wright. L. M. Baldwin. F. P. Mullen. W. C. Drake. H. M. Warren. G. F. Brackett.
Carleton Greene. Wm. Henry. H. C. Bowen. P. W. Henry. H. R. Kasson. W. H. Lober. C. O. Warren. J. R. Warren.

chemical and mechanical tests essential to the success of the uses of asphalt, especially for paving.

Soon after accepting the position of superintendent of tests of the Barber Asphalt Paving Company, he sold his laboratory in Washington and now enjoys the even larger laboratory of the company at New York, supplied with the best equipment and machinery for testing everything involved in asphalt paving.

The agents who solicit the work in the various cities in which they live or of which they have charge in regard to obtaining contracts, are men of mature judgment, selected with great care, for upon them much depends. The pictures of most of them appear in a group with Mr. Rock, the secretary, at a time when they were in New York for a general conference.

The superintendents who perform the work in the various cities under their charge in regard to the execution of contracts, are men of special training who devote their time to the construction of asphalt pavements. This involves, in addition to many other details, the construction and maintenance of machinery, the refining and preparation of asphalt and other materials, the selection and supervision of foremen and others. The pictures of most of the superintendents appear grouped about Mr. P. W. Henry, assistant to the president, at a time when they had assembled in New York for mutual benefit, in the interest of their company.

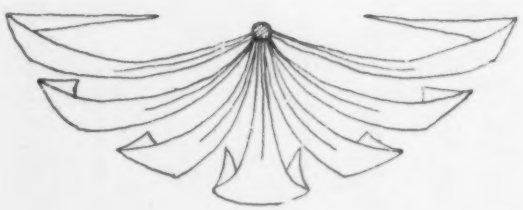
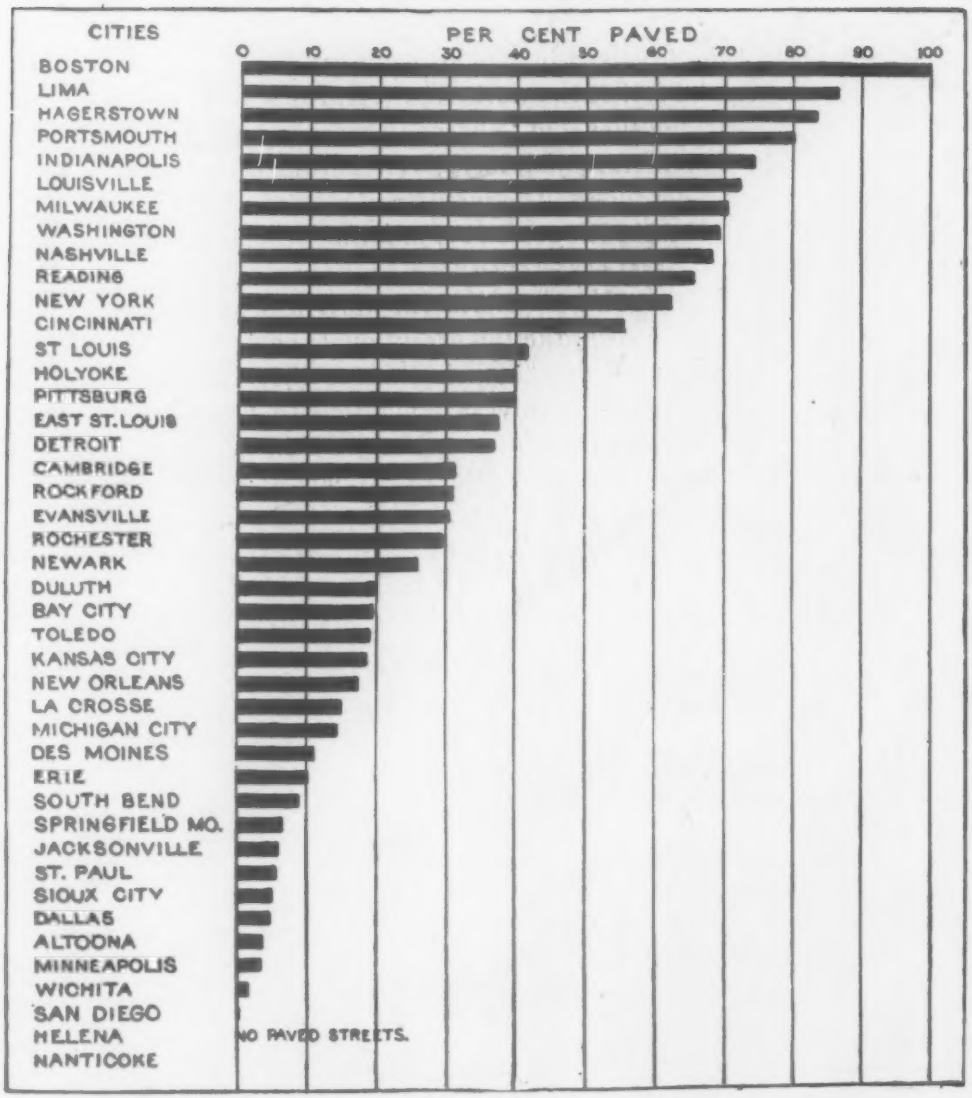


DIAGRAM OF PAVING STATISTICS.

FIG.—PERCENTAGE OF THE TOTAL LENGTH OF ALL STREETS PAVED IN EACH OF THE 43 CITIES.



CEMENT AND ITS USE.

TOPICAL DISCUSSIONS ON HYDRAULIC CEMENT.

Recently the Western Society of Engineers issued a circular to its members and others, requesting information on the following points concerning the use and testing of cements:

1. Relative qualities of the several Portland and natural cements at present in general use.
2. The extent to which the testing of cements is useful in connection with various classes of work.
3. What nature of testing is suitable.
4. The essential points which should be covered in specifications as to testing cements.
5. The influence of the amount of water used in forming pastes and mortars.
6. How the several cement mortars are affected by cold, both in laboratory and practical work.
7. How mortars are affected by tempering.
8. What specifications should require as to mortar and mortar mixing.
9. How cement mortars are affected by different kinds of sand.
10. What extent cement mortar plasters can be relied upon to adhere to cement mortar concretes, especially when Portland cement is used for plaster and natural cement for concrete.

In response to this circular the society received discussions from Mr. Alfred Noble, Mr. Thos. T. Johnson, Prof. Ira O. Baker and others, and their publication in the first number of the *Journal of the Western Society of Engineers* forms a valuable symposium on the subject.

The first question naturally did not receive any definite answer, but Mr. Johnson referred to the increasing number of brands of Portland cement on the market and says that "considering the 'tricks of the trade,' as applied to selling cement, the consumer now and henceforth must exercise more than usual care in selecting his material." Nearly all the writers agree that the testing of cements is of value. Mr. Noble says, in this connection: "It is now possible to buy Portland cement of such uniform excellence that little risk is taken in using it without a test; this character, however, has only been secured by constantly definite requirements made by engineers, and it can hardly be doubted that the quality of the material manufactured would deteriorate if such requirements were dropped."

Mr. Ellis B. Noyes calls attention to the fact that a high test at one or seven days is not always a desideratum in American natural cements, and gives the following table of results obtained with four samples of natural cement, with one part sand by weight:

7 days.	28 days.	6 months.	1 year.
19	41	210	518
12	24	136	530
42	115	202	334
71	182	283	260

Mr. Noyes remarks, "I don't wish to be understood by this as advocating the requirement of lower tests for cements. There are natural cements in which the rais-

ing of the early tests raises all later tests, and in such cases a high requirement is desirable. I wish specially to emphasize the fact that testing may be injurious as well as beneficial unless long experience and judgment are combined in the testing."

The third question, concerning the kind of tests that are suitable, was quite fully discussed by Mr. Noble and Mr. Johnson. The value of the tests for fineness, time of setting and durability are pointed out, and while both of these gentlemen mention the transverse test as of value, they agree that the tensile test, as a test for strength, is not likely to be superseded in the near future.

Mr. Noble makes the following pertinent statements relative to the fourth question: "A better indication is given of the character of a cement at twenty-eight days than at seven, but it is still of less value than tests at the age of three months, six months or a year; how much less depends on the cement and on the peculiar requirements of the work, if the mortar in the work is required to bear its full load in twenty-eight days a test at that age would be satisfactory if it were certain that the mortar would not deteriorate later. A good knowledge of the characteristics of a cement requires, therefore, a series of tests extending over a considerable time; the longer the time the less the chance of later deterioration and the more complete is the knowledge of the ultimate value of the article. It is needless to say that it is impracticable in ordimary cases to obtain any such knowledge of the cement after its purchase and before its consumption. Previous knowledge of the material is implied and is essential. The terms of purchase must be conditioned on some short time test which will simply assure the purchaser that the lot of cement in question corresponds at any early period with other lots of the same brand, the character of which is known and satisfactory."

Tables of experiments are given by several of the writers to illustrate "the influence of the amount of water used in forming the parts and mortar." These tables are too extended to be reproduced, but Mr. Noyes gives the gist of the matter in a single sentence by saying: "Beginning with a mixture of the consistency of damp loam, successive increases in the amount of water will decrease the early strength and increase the later strength to a point to be determined for each cement, after which further additions of water decrease the strength throughout." Referring to the proper amount of water to be used in making concrete, Mr. Noble cites the opinions of several English engineers, in the support of the result of his own wide experience in the use ef concrete, and concludes as follows: "It thus appears that while there is considerable diversity of opinion as to the exact degree of wetness concrete should have, none of the engineers quoted advised such dry mixtures as are commonly required here. The writer believes that a more homogeneous, a denser, and stronger material will be obtained if the concrete is made so wet that the mass will quake after ramming; and furthermore, that where concrete is to be placed in contracted spaces, as between timbers, it may be with advantage made still wetter, so that it can be pushed into place with the shovel and by treading, filling all the spaces solidly, with

no important diminution of strength at any point, but stronger as a whole."

The sixth question received but little attention. Experiments made to determine the effect of low temperatures on mortars do not usually approach sufficiently near to the conditions of practical work to be of much value; and, on the other hand, reports concerning the actual use of cements in cold weather are not generally accompanied by such details of the existing conditions as to make them valuable for guidance in future work.

The effect of regaging mortars is considered by Mr. Johnston, who gives a table representing the results obtained in tests made under his direction for the Sanitary District of Chicago. Only one kind of cement was tested, namely, Louisville. A batch of mortar was mixed and one set of briquets made at once; the rest of the mortar was retempered and water added to keep it at such a consistency as to be readily handled with the trowel. Briquettes were made at intervals of 10, 20, 30, 45 and 60 minutes after the time of first gaging, and the results indicate that for mortars composed of one or two parts sand to one cement by volume, this brand of cement is injured by being allowed to stand more that 10 or 20 minutes after gaging before it is used. The same writer, in treating the eighth question, advocates the use of a screen for mixing cement and sand in a dry state preparatory to mortar making. The dry materials are first overcast with a shovel and then thrown upon a screen which results in a "quite thorough incorporation of the material."

The tenth question is of considerable importance, and one that has not received the attention from engineers which it deserves. Mr. Johnston mentions the sea wall on the lake shore at Chicago as a notable failure, the plaster coat of Portland cement having separated almost entirely from the Portland cement concrete base. On the other hand, a concrete dam, forming part of the works of the Sanitary District of Chicago, is cited as an example of the successful application of Portland cement plaster to natural cement concrete. The plaster was applied nearly a year after the concrete was in place, the latter being scrubbed with a broom and washed by a stream from a hose before the application of the plaster.

The results of some tests made by Mr Johnston in which part of a briquette was of natural cement and part of Portland, are given in a table, and concerning these tests Mr. Johnston remarks, "the results are not very encouraging for the possibility of successfully bonding the two mortars when the surfaces of contact are quite smooth."

The question of the adhesion between Portland and natural cement mortars is of great practical importance in the making of cement sidewalks. It is generally supposed that Portland and natural cement should not be used together when adhesion between two mortar surfaces is requisite. But in many cases sidewalks might be more cheaply constructed if it were allowable to use natural cement for the concrete base and Portland in the wearing surface, and it seems to be an open question whether this combination might not give good results, at least with some brands of cement. We should be glad to hear from any of our readers who have used such a combination.

TENSILE STRENGTH OF A NEW BRAND OF PORTLAND CEMENT.

In the February number of PAVING AND MUNICIPAL ENGINEERING, we referred to the brand of Portland cement being manufactured by the Vulcanite Portland Cement Company, as an indication of what can be produced in America by skilled work and the best facilities. This is a new company and its progress is noted with much interest. The early tests indicated notably high grade qualities, and these are fully sustained by later tests. A six-months' test in the laboratory of Lathbury & Anderson, of a sample taken from a lot of 100 bushels, was completed on April 10th, with a result in tensile strength (three parts sand, one part cement), varying from 360 to 375 pounds per square inch. The previous tests showed at the end of seven days, tensile strength varying from 210 to 221 pounds, and at the end of twenty-eight days from 304 to 360 pounds.

We are also in receipt of a statement from the Hercules Cement Company of the average laboratory tests for the year 1895 of the Hercules Portland cement from 1,000 briquettes, showing a residue of 12 per cent. on a No. 100 sieve, 406 pounds to square inch section in seven days, 602 pounds in twenty eight days, and 680 pounds in three months. Good showings are made of their tests of Rosendale and Lehigh cements.

SLAG CEMENT IN GERMANY.

A report has been sent to the department of state by U. S. Consul-General Frank H. Mason, of Frankfort, Germany, upon the slag cement industry of Germany, in which he says:

Slag cement seems to have been originally suggested by the excellent results obtained in Italy by a mixture of hydraulic lime and puzzolani, or pulverized volcanic lava. About 1863 the proprietors of the George Marie blast furnace, in Westphalia, produced a slag cement and described the process, and other furnacemen soon recognized the possibility of thus disposing of the hitherto worthless slag.

Various methods have been patented for granulating and preparing the slag, among them that of Ludwig Roth, of Wetzlor. It was soon found, however, that the chief difficulty lay in the constituents of the slag itself. The essential cement-making element in the basic slag is silicic acid, and the questions to be determined were whether this acid was in sufficient proportion; whether it was in condition to readily and firmly unite with the lime, and whether there was a due proportion of magnesia and no excess of sulphide of calcium or sulphuric impurities. Through these practical difficulties German cement makers stumbled for years, until finally repeated failures brought the whole process into disrepute, and the Portland cement makers, to defend themselves against the charge of adulteration with cheaper slag cement, were compelled to sign an agreement to make no more of it. To-day, says Mr. Mason, only two firms in Germany manufacture slag cement, Messrs. Bocking & Dietsch, of Malstatt-on-Saar, and Erhardt Bros. & Lingenbrinck, of Neunkirchen.

These firms maintain fully equipped testing establishments, and the product is approved of and used by the engineers of Frankfort, Cologne and other German cities. In shipments of 50 tons or more, it is sold at $1.28 per barrel of 330 lbs. As compared with Portland cement, it has a lower specific gravity, and ten metric tons of slag cement occupy 10 cu. m. of space, while the same weight of Portland cement fill only 7 cu. m. Slag cement is generally used in the proportion of 1 part of cement to 3 or 4 parts of sand, and requires about 24 hours to set.

This slag cement is successfully employed in building foundations and in hydraulic construction, but it is not adapted to boiler setting or to use in the open air as mortar for brickwork. It is used in the foundations of sewers, but owing to its slow setting is not employed in the upper parts of such construction. It is also extensively used in the manufacture of paving tiles, being for this purpose mixed with fine Rhine gravel and quartz sand, and submitted to a pressure of 500 tons in a hydraulic press. The resultant tiles, eleven of them covering 10.8 square feet, or 1 square meter, cost 81 cents per square meter. Slag from gray foundry pig, smelted under high pressure and as free as possible from sulphur, is generally selected for this purpose. A slag giving good

results is thus analyzed by Roth in 1883: Lime, 51.62 per cent.; silicic acid, 35.12 per cent.; argillaceous earth, 8.53 per cent.; magnesia, 1.58 per cent.; peroxide of iron, 0.87 per cent.; peroxide of manganese, 0.37 per cent.; sulphur, 0.88 per cent. Those interested further in this industry are referred, by Mr. Mason, to the writings of Prof. Tetmaier, of Zurich, one of the greatest living authorities upon building materials and an early advocate of slag cement.

Consul P. Lieber, of Dusseldorf, says there are five concerns making slag cement out of the 20 active German cement factories, but Dr. Wilhelm Michaelis, of Berlin, an authority upon cements, says that the industry is well-nigh suppressed and dead in Germany. Dr. Michaelis ascribes this to the fact that the government has been ill-advised and has failed to give the cement a proper trial, and then the well organized and powerful Portland cement industry "formed a ring against slag cement." He says the manufacture is well developed in France by a premium on excellence offered by the government.

WHAT CAN BE DONE WITH A BARREL OF PORTLAND CEMENT.

In a little pamphlet issued by the Hercules Cement Co., is given the information that one barrel of Portland cement, of 400 pounds, has the capacity to cover neat:

When Used with 1 Barrel of Sand.

68	square	feet	1	inch	thick.
102	"	"	¾	"	"
136	"	"	½	"	"

When Used with 2 Barrels of Sand.

99	square	feet	1	inch	thick.
148½	"	"	¾	"	"
198	"	"	½	"	"

When Used with 3 Barrels of Sand.

130	square	feet	1	inch	thick.
195	"	"	¾	"	"
260	"	"	½	"	"

ANSWERS TO QUESTIONS.

[By J. W. Howard, B. L., C. E., for Paving and Municipal Engineering.]

HOW TO DO VERTICAL WORK IN ASPHALT SURFACING.

How should vertical work of asphalt surfacing be done?

C. H. Weiss, Houston, Tex.

If you mean the extension of an asphalt surface on the floor of a building such as a stable, brewery or hospital, up the walls a short distance around the edge of the rooms, it is best done by the use of asphaltic mastic prepared by tempering powdered natural asphaltic limestone with a little refined Trinidad or other asphaltum. Practically it is best to purchase the prepared asphaltic mastic supplied by several companies importing their material from Europe. Then follow the directions of the company or persons from whom you purchase. You would melt the cakes of mastic after breaking them up, add a little refined asphaltum, also a little sand. The whole would be applied hot with wooden spatulas, a form of trowel. The thickness for vertical work is usually from a quarter to half an inch.

If you mean in your question the application of asphalt to the outside of foundation walls, etc., to exclude moisture, it is best done by making a mastic of any suitable natural asphalt, which should be applied while very hot directly upon the exterior of the walls after the walls had been painted over with hot, pure asphaltum applied with brooms for brushes.

If you mean the application of asphalt to the interior surfaces of reservoirs, cisterns and tanks, it is

not possible to here give the method, for it is long and complicated. In fact, the best specifications for such work are not yet fully decided upon.

STRENGTHENING OF CONCRETE SIDEWALKS AND CURBS.

Is it well when laying concrete sidewalks, curbs or combined curbs and gutters, to incorporate iron rods or bars in their interiors? *Field.*

There is no question, if properly done, that it is an advantage to thus increase the tensile strength of almost all forms or shapes of artificial stone as used for the purposes mentioned in the question. A strong proof is the behavior of concrete arches with metal ribs, in what is known as the Monier system, under the tests recently finished in Austria. Although this system of arch construction is not used for the purposes named by Mr. Field, nevertheless the principle is proven, that the strength of the mass as a whole is increased by the presence of metal rods or bars properly disposed in the interior.

There is no increase in its resistance to crushing by having a curb or sidewalk block or slab of artificial, hydraulic cement concrete stone stiffened by means of iron. The presence of metal is there to give strength to resist cross strains and shocks.

Less thickness of concrete is allowable in sidewalks and curbs where stiffening rods are used. A little less cement is necessary, and, except for the wearing surface, cheaper brands can be used with as good results as when better cements are employed without rods.

The action of frost and growing roots of trees, slightly lifting large sidewalk blocks of artificial stone, will not crack them when iron rods are used.

It frequently happens that a sidewalk must be removed to gain access to the water, sewer, gas or other pipes entering a house from the street, in which case, if the sidewalk slabs are sufficiently rigid because of stiffening bars within them, they can be removed and properly replaced.

These bars can be used by any person, although care must be taken not to infringe upon certain patented devices which are extensively used throughout the country. These devices are for rods which interlock by special means near the corners of the stone as well as for special shapes of the rods designed to enable the concrete to better envelop and adhere to them.

A well-finished concrete sidewalk, curb and gutter is handsome and durable. They are especially adapted for streets of light traffic, park roads and private drives.

In the April number of PAVING AND MUNICIPAL ENGINEERING, page 266, an answer to a question on the use of artificial stone can be read with profit in this connection.

PROPORTION OF USABLE PAVING BRICK.

What proportion of the product of a brick paving kiln is reliable for paving? *M. E.*

Constant demand for better paving brick has resulted in much improvement. The "down-draft" kiln has replaced many of the old "up-draft" ones. This comparatively new form of kiln is more reliable than the old one, and produces more uniform paving brick, with a less proportion of each burning unfit for use upon streets. The bricks which are, or should be, rejected for use in pavements, can be used for the interior walls of buildings and otherwise. No manufacturer nor contractor should hesitate to reject for use as pav-

ing bricks all those of doubtful quality.

The question, as submitted, admits of more than one answer. If he means strictly first-class paving brick, experience has shown during the past two years that seventy per cent. is a high average to place upon the output of the run of a paving plant. With every precaution and the best of clay and skill a modern kiln has turned out as high as ninety per cent., but this can not be counted upon. For streets of light traffic in small towns many paving brick manufacturers regard an output of seventy-five per cent. to eighty per cent. as good pavers.

IMPORTATION OF PORTLAND CEMENT.

We desire statistics of importation of Portland cement for ten years ending with 1895. We will deem it a favor if you will let us know where we can obtain this information and at what cost.

F. L. Smidth & Co., N. Y.

The manufacture of good Portland cement has now gained such headway in the United States that the importations will probably decline each year, or at least increase in the future in less proportion than in the past. There are a very few brands of Portland cement being made in the United States far above the average imported. Many of the natural cements made in the United States are not truly hydraulic, and a few of the American Portlands can not strictly be recorded as true Portland cement.

The records of importation of cements into the United States make no distinction between Portland, Roman and other cements.

The amount of Roman and other cement is so very small compared with the Portland, that it does not practically affect the record. As Roman cement is used for purposes for which, as a rule, Portland is suitable, the following statistics may be recorded as the amounts of Portland cement annually imported:

1884	585,768	bbls.
1885	554,396	"
1886	650,032	"
1887	1,070,400	"
1888	2,019,718	"
1889	1,515,316	"
1890	2,169,590	"
1891	2,726,722	"
1892	2,598,628	"
1893	2,833,031	"
1894	2,514,013	"
1895	2,660,633	"
Total in 12 years	21,898,247	bbls.

BICYCLISTS AND GOOD PAVEMENTS.

How may the thousands of bicyclists be made of more practical use in helping to furnish our cities with more good asphalt, reliable brick and other modern pavements? *J. L. G.*

The bicyclists individually and through their organizations have been of great value; first, in forming public opinion; second, proposing general legislation; third, in bringing about practical results in regard to the improvement of country roads in Europe and America.

They have not been able to influence the improvement of city streets as much as many of them have desired.

Wherever a smooth, durable pavement has at last entered a city the bicyclists work in every honorable way to obtain more of it for their comfort and convenience.

The writer of the above question must recognize the fact that the motives of most men are unfortunately somewhat selfish. This is why the bicyclist wishes more smooth pavement. From the same motive the property-holder, who has to pay for the change, however desirable, retards the increase of such pavements.

Great progress is being made and the streets of American cities are

steadily improving. The bicyclists have some influence, but the comfort, convenience, health and beauty of good pavements influence all who have once seen them.

PECULIAR NOISE ON BRICK PAVEMENTS.

The brick pavements laid for the first time in 1895, in Newark, N. J., on 6 inches concrete and 1½ inches sand, joints filled with Portland cement grout, produce a loud rumbling when vehicles pass over them. What is the cause of this noise?
Engineer, Board of Works.

This question has arrived almost simultaneously from several cities, although expressed in different words. The engineer whose question we print has suggested a very plausible, theoretical answer, but because other explanations have been received from other cities and because experiments are being made to see if it is not possible to overcome this objection of noise connected with many brick pavements, we refrain from answering until various opinions of different city engineers are all received, and our own investigation, now that the frost and snow have disappeared, has been completed.

Will any reader please feel free to communicate to the Question Department of PAVING AND MUNICIPAL ENGINEERING his opinion on this subject?

PREPARATION OF ASPHALTIC CEMENT IN BINDER COURSE OF PAVEMENT.

How much hot asphalt is used with each pound of crushed stone for making what is known as binder, or first coat of asphalt pavement, as made in our city over macadam and old stone block pavements?
J. S., Harlem, N. Y.

The writer of the question undoubtedly meant how much "asphaltic cement" is used in the preparation of the "binder" or fine bituminous concrete mixture. Hot asphalt is never used. Asphaltic cement is composed of refined asphaltum combined with a little residuum oil of petroleum. Sometimes an appropriate maltha is used instead of the residuum oil.

The proportions used for compounding the binder are about fifteen gallons of asphaltic cement to each cubic yard of crushed stone, usually about one inch size. The proportion varies slightly with the character of the stone and the thickness of the binder desired when compressed in place either over old macadam, worn-out stone, asphalt block or brick pavement or directly upon the hydraulic cement concrete foundation. This binder layer adds greatly to the strength and durability of the asphalt paving mixture which is laid upon it.

The binder varies from one to one and one-half inches in thickness according to the specifications. The asphalt pavement surface varies from one to two inches in thickness as desired for light, medium or heavy traffic.

TOTAL OF ASPHALT PAVEMENTS IN AMERICA.

Can you give me the total number of square yards of Trinidad asphalt pavement and other asphalt pavement in America on January 1, 1896? *J. H. C.*

The total Trinidad lake asphalt pavement laid since about 1878, in the United States and in use on Jan. 1, 1896, was 19,348,716 square yards—the equivalent of about 1,335 miles of roadway of an average width of 26 feet. This was laid by about forty-eight paving companies and contractors, although two or three paving companies have laid a little more than half of it.

Many pavements have been laid with other materials than the Trinidad lake asphalt. Without including the coal-tar, vulcanite and other

imitations of asphalt pavement, the total amount of other asphalt pavements which have been laid is a little more than 1,200,000 square yards, of which about 900,000 square yards were in use on the streets of the cities of the United States and Canada Jan. 1, 1896. The largest part is that of European rock asphalt, technically described as "asphaltic limestone." The use of this, however, is diminishing, because it is probably more expensive for the contractors to lay than the mixtures composed of sand combined with Trinidad or other asphalt. The natural asphaltic sandstones of California have been extensively used there with fair results, where a firm, solid, even pavement is not demanded, as in the eastern cities of the United States. The balance of the 900,000 square yards of various asphalt pavements is composed of mixtures of sand, with California asphalt, according to specifications somewhat similar to those used for laying Trinidad asphalt pavements; also, pavements made of materials from Kentucky and Utah, as well as Trinidad "land asphalt" pavements. The above statistics are given without reference to the comparative merits of the many kinds of asphalt pavements. That is a matter which must be investigated through other channels. Our subscriber who asks the question can rely on the above statistics as very closely correct. They are the result of statistics accumulated each year, for many years, by the editor of the "Question Department" of PAVING AND MUNICIPAL ENGINEERING. This is the first time they have been published in the form presented to date. They cover, of course, the United States and Canada.

MACHINERY FOR RAMMING PAVEMENTS.

Is there any machine for ramming or pounding brick, granite or broken stone roadways? *P. N. M.*

Several attempts are recorded in the "Annals des Ponts et Chaussees," the publication of the engineering school of bridges and roads of France. Herr Dietrich, of Berlin, Germany, devised a stamping machine for compressing asphalt pavements; none of these proved successful in practice. J. J. Doyle, of Albany, N. Y., devised several models, which seem to have failed in practice. On the whole, the conditions vary so much in connection with paving of city streets, that automatic or mechanical rammers have thus far been failures.

COST OF ASPHALT PAVING IN DIFFERENT CITIES.

I would be obliged for information concerning prices paid by leading cities for asphalt paving, stating number of inches of concrete base and wearing surface.
Robert Pratt, Mayor, Minneapolis.

While the thickness of the different portions of an asphalt pavement in the same city determines in a large degree the cost, these variations can not form a general basis of comparison of the prices paid for paving in cities widely separated from one another. In some cities the removal of an old pavement, the grading of a street even more than the eight or nine inches necessary to give room for the pavement, readjusting manholes, sewer basins, resetting old curbs, relaying crosswalks on adjacent side streets, are each paid for separately as extra work. In many cities several of these items are covered by the price bid for the pavement. Washington and Brooklyn, with their apparent low prices, represent one extreme where everything, including length of

haul and other items locally important, are separately paid for. New York and Buffalo represent the other extreme, where the city includes the entire cost in the item of pavement per square yard.

There are great variations between such a place as New York and Topeka, Kan., in the items of rent, taxes, freight, cost of cement, crushed stone, sand, etc., which materials constitute about 94 per cent. of the base and surface. Asphalt is about 15 per cent. of the surface, or 6 per cent. of all the materials purchased. The cost and hours of labor vary. A few cities permit eight, many ten, and several twelve hours work. The one and two loads possible per day from the asphalt works to the distant parts of New York, Chicago and other cities, add much to the cost, compared with other parts of these and other cities where six, eight and ten loads can be delivered by each wagon during the day. The amount of work done in a city in one season aids much in its economy. The cost of a pavement is as much a local question, controlled by local conditions, as the cost of waterworks, sewers and other public work.

The period of guarantee of pavement is now fixed by custom at five years, but where local laws and other special provisions have increased it to ten, thirteen or fifteen years, a comparison of cost becomes very difficult and misleading.

With the above in mind it is best to refer to the following places in previous issues of PAVING AND MUNICIPAL ENGINEERING rather than here publish a table which experience has shown is easily misunderstood by many persons who have not the time to investigate the subject more closely. Moreover, by referring to the places indicated, the local conditions can be often noted. During 1895 (included in Vols. 8 and 9) the prices were low because of very bitter competition and depression in business:

Toronto, Vol. 8, page 27; Washington, Harrisburg, Scranton, Pittsburg, Kansas City, Chicago, Cincinnati, Columbus, Detroit, Cleveland, Buffalo, Syracuse (with details), Vol. 8, pp. 28, 29, 30; Cleveland, Buffalo, Chicago, Milwaukee, Indianapolis, St. Louis, Vol. 8, p. 75; Syracuse, Vol. 8, p. 102; Toronto, Vol. 8, p. 190; Newburg, Saginaw, Jersey City, Minneapolis, Syracuse, Louisville, Springfield, Williamsport, Scranton, Hamilton, St. Paul, Altoona, Providence (totals), Vol. 8, p. 288; Toronto, Vol. 8, p. 320; Brooklyn (over stone), Vol. 9, p. 62; Wilkesbarre, Vol. 9, p. 62; Binghamton, Kansas City, Vol. 6, p. 122; St. Paul, Milwaukee, Vol. 9, p. 184; Watertown, New York City, Brooklyn (over stone), Newark, Vol. 9, pp. 185, 186; St. Paul, Milwaukee, Schenectady, Vol. 9, p. 355; Newark, Milwaukee, Vol. 9, p. 256; Binghamton, Vol. 9, p. 383; Kansas City, New York, Vol. 9, p. 384; Brooklyn (bitter competition), Vol. 10, p. 117; Niagara Falls, Rochester, New Orleans, Vol. 10, p. 144; Rochester, Hoboken, Youngstown, Minneapolis, Vol. 10, p. 220; New York, Chicago, Philadelphia, Brooklyn, St. Louis, Boston, Baltimore, Cincinnati, Buffalo, New Orleans, Washington, Detroit, Milwaukee, Newark, Minneapolis, Louisville, Omaha, Rochester (with details), Vol. 10, p. 236.

CURRENT INFORMATION.

PLANS FOR THE BETTERMENT OF CINCINNATI'S WATER SUPPLY.

The engineer commission, composed of John W. Hill, S. Whinery and G. H. Benzenberg, appointed to consider the extension and betterment of the water-works of Cincinnati, has submitted a report which, aside from its treatment of local questions, contains much general information regarding the dangers of a contaminated water supply, such as Cincinnati's is shown to be. The commission rejects as impracticable the various suggestions for obtaining a supply from any other source than the Ohio river, which, though badly polluted, can be rendered fit, the commission says, for domestic uses.

The plan proposed by the commission provides for subsidence of suspended water in reservoirs of medium capacity, combined with filtration through beds of sand. The commissioners believe that sedimentation for from four to six days in subsiding reservoirs, supplemented by careful filtration conducted upon bacterial lines, will, in the case of the Ohio river, produce an effluent "which will compare in all respects with the water of any city in the world." This judgment is based on experiments with water during the last two years, a study of the methods of operation and results obtained from sand filters abroad and from the experiments of the Massachusetts state board of health in 1894. Sedimentation, as proposed, will reduce the suspended matter upwards of 80 per cent., it is claimed. In this condition it will go to the filters with little of the matter that is known to clog the surface of the sand beds.

The reservoirs have been designed for a capacity of 300,000,000 gallons, and the filters 66,000,000 gallons per day. The plans for betterments, with estimates of cost, embrace a high service pumping station to accommodate six triple expansion pumping engines of 20,000,000 gallons daily capacity, $249,681.23; a force main to subsiding reservoirs, $477,112.16; subsiding reservoirs, six of 50,000,000 gallons capacity each, $1,047,420.07; eleven filters of 6,000,000 gallons capacity each, $948,782.64; conduit pipe from clear well to high service pumping station, $69,199.20; high service pumping station, $157,494.67; rising mains to high level reservoirs, $258,006.52; high level distributing reservoirs, two of 100,000,000 gallons capacity each, $708,239; conduit line from high level reservoir to Eden Park reservoir, $1,045,183.25; eight triple expansion pumping engines of 20,000,000 gallons daily capacity each, with boiler, $760,000; engine and boiler foundations, $65,124.04; engineering, superintendence, and contingencies, $588,624.28; total, $6,474,867.06.

AMERICAN WATER-WORKS ASSOCIATION.

The sixteenth annual convention of the American Water-works Association will be held in Indianapolis, May 26, 27 and 28, at the Denison Hotel. The program embraces papers as follows: "What I Saw in Egypt," Jos. P. Donohue, Davenport, Iowa; "Health Improb-

able, Economy Impossible, without Filtration and the Water," Jos. B. Rider, Norfolk, Conn.; "The Meridian Case," W. B. Milner, Birmingham, Ala.; "A Talk upon Water Tube Boilers," E. H. Wells, New York City; "Vegetable Growth in Water," Stanley Coulter, Lafayette, Ind.; "Water Supply and Distribution, City of Brooklyn," Peter Milne, C. E., Brooklyn; "Water Supply of Indianapolis;" Dr. J. N. Hurty; "Inside Fire Protection Lines," George Reyer, Nashville, Tenn.; "Pollution of Streams," Albert Baker, Indianapolis; "Characteristics of the Mississippi River," Erastus G. Smith, Beloit College; "Asphalt Lining for Old and New Reservoirs," L. J. Le Conte, C. E., Oakland, Cal.; "Our Experience with Automatic Flush Tanks," W. H. Laing, Indianapolis; "Out of the Ordinary," Jacob P. Dunn, Indianapolis; "Laying Water Mains," J. H. Decker, Brooklyn, N. Y., and probably a poem by James Whitcomb Riley.

ASSESSING THE COST OF PAVING STREET INTERSECTIONS.

A paving bill has passed both houses, at Des Moines, Ia., which amends the law so that cities of the first class will be permitted to proceed with paving wherever petitioned by property-owners and ordered by the city councils, and assess the property fronting or abutting on the streets or alleys so paved with the entire cost of paving and curbing, together with all work on the intersections. Any amount of paving can be done without reference to the debt of the cities.

Much importance is attached to the measure in Cedar Rapids, inasmuch as Mayor Lincoln and several members of the city council have for some time contended that the city possessed these rights under the laws which were already on the statute books. An ordinance is now pending in the court, which was introduced two weeks before the paving bill passed in the legislature, and its provisions are the same as those in the paving bill, which provides the manner in which grading, curbing, and paving of the streets and alleys of the city may be done.

The city has been compelled, heretofore, to pay for the paving and grading of intersections, and as it had reached the limit in its indebtedness, it has been unable to order more paving done.

RIGHTS OF BIDDERS ON A BRIDGE CONTRACT.

An injunction was ordered, April 6, at Topeka, Kan., by Judge Hazen, in the awarding of a bridge contract. The lowest bid offered for spanning the Kaw was by Keepers & Thacher, of Detroit, but before the commissioners could award the contract the next lowest bidder secured a temporary restraining order. Judge Hazen, in handing down his opinion, stated that he believed the commissioners had in no way exceeded their authority; the proposition to build a Melan arch bridge had been submitted to the voters, and the people had accepted it; the plans had been prepared by Keepers & Thacher, and later, when the board of commissioners learned the kind of bridge that had been determined upon was patented, measures were taken to secure the royalty and have the bidding open; after Keepers & Thacher had finished the plans, their connection with the commissioners ceased, and they had earned all the compensation they received, and after that they were eligible as competitors in the contract of erecting the bridge.

The contract has since been awarded to Keepers & Thacher.

USE OF SEWER SYSTEM FORBIDDEN.

A decision has been rendered by Judge Spring which involves the right of the city of Jamestown, N. Y., to use a system of sewers which was constructed two years ago at a cost of about $200,000. The present terminus of the sewer is in the outlet of Chautauqua Lake. When the system was completed and ready for use, Mrs. Charlotte F. Tiffany, who owns a farm on the banks of the outlet, near the city, secured a temporary injunction forbidding the use of the system with that terminus. The suit was brought in Mrs. Tiffany's name, but she was supported in her action by a number of residents along the outlet. The decision makes the temporary injunction permanent and will have the effect of compelling the city to build chemical disposal works, if it uses its sewer system. It is probable that this will be done, for to appeal to higher courts means years more of litigation.

A STATE ROAD BUREAU FOR NEW YORK.

A bill is before the legislature which proposes a state road bureau for the state of New York. The state engineer is to establish the bureau, in connection with his own department, and is to appoint a civil engineer, an expert in road construction, to take charge of the bureau, at a salary of $3,000 per year, and expenses.

The new officer is to collate information relating to the state highways. He is to divide the state into divisions of one or more counties each, and estimate the possible cost of road construction in each. He is also authorized to obtain from the proper county boards, or municipal officers, before July, 1896, the names, descriptions, conditions, etc., of all highways in their territory.

LITIGATION OVER THE BIG SEWER CONTRACT AT SAN ANTONIO.

In the sewer injunction suit of Wilding, Marshall, Backus & Hines *vs.* The City of San Antonio *et al.*, Judge Maxey, of the Federal court, decided in favor of the city. Judge Maxey based his opinion upon the contract itself, the basis of complainants' suit. He referred to that provision of the contract which provided that the contractors agreed that if,

> In the opinion of the said city the several works, or any portion thereof, are not being done in accordance with the terms, all and several, of this contract, or are not proceeding at a rate which will insure the completion of the several parts thereof, and the same in the manner and with such materials, in such quantities and at such dates as expressed in this contract and specification, then it shall be lawful for said city to proceed forthwith and cause to be executed all said works so improperly performed, and to supply new materials for those which are of improper quality, or use such materials as may be found on the works, and to employ such additional men as the city may deem expedient, by day work or otherwise, to properly forward and complete the works, or to expel the said parties of the second part (meaning the contractors), forcibly if necessary, and to proceed to complete the said works at the sole charge and expense of the contractors without prejudice to the rights of said city to recover damages of the contractors for breach of the contract, after having given notice thereof in writing three days before employing additional men or procuring additional and proper material or expelling the contractors, and the entire expense incurred in executing the whole of said works shall be allowed and paid by the contractors to the city entirely in accordance with the decision of the engineer, and from whose decision there shall be no appeal,' and the rights of the city to take possession of the work included the right to take possession of the entire plant of the contractors.

Judge Maxey held, in construing that part of the contract, that as the

RECORD TABLE OF STREET TRAFFIC.

Name of Street..... *Class of Pavement* ..... *State of Repair*.....

Width between Curbs.....*ft.* .....*in.* *Gradient 1 in*..... *Period under observation from*

time and date *time and date*

.....*to*..... *Name of Observer*.....

Insert each hour, and run line across page to show traffic from hour to hour.	Description of Vehicles.										Exceptional Loads. Weight to be Inserted.	Horses Falling.	Condition of Road at Time of Fall (Wet, Dry, Greasy, Sloppy).
	Omnibuses.			Heavy Dray.	Light Dray.	Heavy Van.	Light Van.	Tradesmen's Shop Vans.	Carriages and Cabs.	Loaded Carts.	Empty Carts.			
	Full.	½ Full.	Light.											
	65 cwt.	45 cwt.	35 cwt.	90 cwt.	40 cwt.	70 cwt.	36 cwt.	15 cwt.	15 cwt.	40 cwt.	18 cwt.			

contractors had bound themselves to execute their contract, to grant an injunction would be to deny to the city the right either to require the contractors to go on with their work or to take benefit of the contractors, or either relet the same, or complete the work, and that a court of equity was not organized for such a purpose; that complainants had their remedy, if any, at law, and the questions involved a constitutional right of a trial by jury upon the facts, and that while the court of equity was far-reaching, and properly so, in its powers to grant relief in proper cases, that the case before the court was not a proper case for relief, and that the court would not put its hand upon the city to restrain it from such an important work.

The effect of this ruling is to leave the city free to take such steps to complete the sewers as may be thought necessary and permissible under the contract. The complainant gave notice of an appeal to the United States circuit court of appeals at New Orleans. Counsel for complainant requested the court to grant a restraining order pending the appeal, which was refused by the court. To the claim of counsel that the court ought to restrain the whole or a part of the fund for the benefit of the contractors, the court replied that there might be no fund to the credit of the contractors after the city had completed the contract and paid therefor.

A COMMITTEE'S RECOMMENDATIONS REGARDING PAVEMENTS.

The report of the street committee was discussed by the Board of Trade, at Bridgeton, N. J., April 16. The committee, consisting of Messrs. Ed. M. Fithian, Oberlin Smith, and John Ogden, had been instructed to make inquiries concerning the character and cost of various kinds of street paving now in use, with a view to recommending to council that which would

seem best applicable to Bridgeton. The report reviews at length information gathered in the neighboring cities of Philadelphia, Trenton, and Wilmington, regarding the pavements in use, and concludes that "the necessities of Bridgeton, not severe enough for stone, will be satisfactorily met by the adoption of either asphalt or brick, as may, in the judgment of council, be best suited to existing financial conditions, asphalt being the best, but brick being good enough. The latter will, if properly laid, be sufficiently strong and durable for our heaviest traffic, smooth enough to delight the increasing army of wheelmen and call a halt upon the expensive wear and tear of wagons, noiseless enough as compared with stone to prevent serious objection on that account, cleanly, if properly cared for, to a degree that will be a revelation after what we have endured of mud and filth, and all with an economy of expense, both in first cost and maintenance, that will create a demand for its constant and rapid extension." The committee recommends that brick pavements should be built "invariably on concrete foundations, and with cement groutings." An immediate beginning of extensive work is advised.

THE NEW YORK BILL AGAINST IMPORTED PAVING MATERIALS.

The committee on cities of the New York assembly, on April 16, decided to report favorably the bill of Assemblyman Leonard, requiring that preference shall be given to native products in the paving of streets in that state, "conditions of price and quality being equal."

The opinions of New York officials regarding this measure were published in the April number of PAVING AND MUNICIPAL ENGINEERING. Even if the bill finally passes the legislature it is believed by many that it will be declared unconstitutional by the courts.

ANALYSIS OF WOOD PAVING BLOCK.

A report on wood pavement considered in relation to public health has been issued by Dr. Blyth, health officer for Marylebone, wherein he points out that the slightest fall of the barometer results in the abstraction from the earth of a large amount of the air in it, and that, therefore, a large part of the air supplied to a home that is not built on an impervious foundation, such as concrete, is often necessarily impure, as gases emanating from the soil are delivered into the basements of homes, as if through pipes, unless the foundation is impervious. To satisfy his desire to know whether the emanations from wood pavement in hot weather came from the surface or whether the blocks were saturated throughout, Dr. Blyth procured two blocks, which for six years had been in the pavement of Oxford street, one from the center of the road and one from the channel. He cut slices from the top, middle and bottom of each and carefully analyzed their contents. The center block showed most ammonia in the top layer, while the channel block was saturated at the bottom by a layer of foul water flowing beneath and gravitating it to the lowest point. His specimens would yield at this rate over a pound and quarter of solid ammonia to 1,000 square yards of wood pavement.

TESTS OF GRANITE FOR PAVING.

City Engineer Stanley and the board of administration of Cincinnati are in receipt of a report on the tests of Lithonia, Venable, Pine

Mountain and Mt. Airy granite blocks. The granite was tested by being crushed under a machine made for the special purpose by the government. The mean test of Mt Airy granite was 20,497 pounds to the square inch; Lithonia, 21,849 pounds; Pine Mountain, 18,577 pounds; Venable, 21,645 pounds. For a long time the Richmond granite was the standard for paving, and lately this has been supplanted by Lithonia, but there has never been a true standard, based upon actual tests in the city. City Engineer Stanley will make a report as to which granite he considers best.

GOOD ROADS IN NEW HAMPSHIRE.

A good roads convention will be held May 13 and 14, at Concord, N. H. A discussion of practical methods of road building and a practical exhibition of various kinds of road machinery used in New England will be interesting features of the convention. The program embraces addresses by Austin Corbin, Dr. C. E. Harrington, of Waltbury, Mass.; Dr. Alonzo Tocole, of Freedom, N. H.; Willard Bill, jr., Westmoreland; Prof. C. H. Petteo, Durham.

STEEL TRACKS FOR WAGONS.

An effort is being made in New York and New Jersey to introduce flat steel tracks for wagons on a few country roads. A company is being formed with this in view. But as the tread or gauge of wagons varies it is difficult to determine the width apart to lay these tracks.

The problem of frost is a serious one. It is claimed by the promoters of this project that good subconstruction and draining will prevent injury from frost. Many efforts have been put forth, especially in Europe, in this direction.

LEGISLATION AFFECTING THE SALE OF ROAD MACHINERY.

New York is giving the country some remarkable specimens of state legislation. Although not yet a law, a bill was passed by the upper branch of the legislature, on April 15, requiring road machine agents to secure the consent of a majority of the property-owners of a town before a road machine can be purchased by the town.

A WOMAN'S MUNICIPAL IMPROVEMENT ASSOCIATION.

The Woman's Municipal Improvement Association has been organized at Newark, N. J., and a crusade against the untidy condition of streets and sidewalks has already begun. The careless overloading of garbage cans and boxes with kitchen refuse, coal, ashes, paper and every kind of waste, the surplus of which finds its way to the sidewalk or gutter, had previously given cause to much complaint, and personal appeals to the people who persisted in such carelessness proved fruitless. The reformers then tried fixing to the telegraph poles and tying posts the following notices:

Your attention is called to the fact that many persons, in violation of law, sweep the dirt, dust or refuse of their stores and dwellings into the street; or throw paper, or fruit parings, or other refuse, upon the sidewalks and the street; or open packages of merchandize on the sidewalk; or shake carpets, rugs or mats so that the dust from the same falls into the street. So long as these practices continue it is impossible to secure the proper cleanliness of the streets.

Extracts from the ordinances bearing on the subject followed this, but these efforts were in vain.

The desire to overcome the nuisance actuated the organization of

the association. As a means of suppressing the refuse and paper nuisance circulars will be distributed, reading as follows:

DID YOU EVER THINK

that you are largely responsible for the filthy condition of our streets? No! Did you permit that ash can to be placed in front of your residence this morning in which there was a quantity of loose paper to be blown about the streets by the first passing breeze? This is the most fruitful cause of the untidy appearance of our streets. We shall never have a clean city until all paper and light materials are burned. You want a can large enough to hold your ashes. You have no right to be a nuisance to your neighbors by neglecting so trifling a matter.

(Cut this out and place it where it will be seen.)

NOTICE.

How to keep our streets clean:

Burn up all paper and light material of every description. Never under any circumstances place it in the scavenger can, it may be blown about the streets, becoming a source of annoyance to neighbors, and it will make the streets untidy.

A resolution will also be adopted, giving the secretary authority to communicate with the police magistrate, notifying him of each violation of the city ordinance, and requesting him to at once take steps to prevent the repetition of the violation, or failing in that, to impose the prescribed penalty.

It is not the association's intention to oppose or attack the methods of street cleaning pursued by the administrative board, but to co-operate with and act as an auxiliary to the commission.

In Philadelphia, the Woman's Health Protective Association has organized the school children into brigades, who are pledged to assist in the abatement of the waste-paper nuisance through which the streets become littered.

PERSONALS.

Mr. Bertram Brewer has been elected city engineer at Waltham, Mass.

Major George T. Clark, C. E., died at Kalamazoo, Mich., March 28.

Mr. Benjamin Gardiner has been elected city engineer, at Calais, Me.

Mr. C. H. Van Auken has been elected city engineer, at Cohoes, N. Y.

Mr. Eugene A. Carroll has been nominated for mayor, at Morristown, N. J.

Mr. A. R. Rupp has been elected city engineer at Mechanicsburg, Pa.

Mr. John C. Rankin, jr., was elected mayor at Elizabeth, N. J., April 14.

Mr. John T. Hash has been appointed superintendent of water-works at Bath, Me.

Mr. William Falconer has been appointed park superintendent at Pittsburg, Pa.

Mr. L. T. Roux has been elected superintendent of the water-works at Gainesville, Ga.

Mr. L. R. N. McCleery has been appointed inspector of private drains at Louisville, Ky.

Mr. Henry Childs has been appointed superintendent of streets at Wellesby, Mass.

Mr. James M. Seymour has been elected mayor at Newark, N. J., to succeed Hon. J. A. Lebkuecker.

Mr. J. H. Morris has been elected president of the board of water-works trustees, at Youngstown, Ohio.

Mr. Oliver M. Wilson read a paper before the Board of Trade, at Kansas City, Kan., April 20, on "Parks."

Mr. Edwin Howard, of the firm of Evens & Howard, fire-brick manufacturers, St. Louis, Mo., died April 1.

Mr. J. B. Henderson has been elected street commissioner, to succeed Mr. E. M. Sutton, at Burlington, Vt.

Mr. W. F. Burlingame and Mr. Geo. S. Russell have been elected water commissioners at Olean, N. Y.

Mr. Elwyn G. Preston has been elected a member of the water board at Woburn, Mass., to succeed Mr. T. F. Kelley.

Mr. Orestes Cleveland, ex-mayor of Jersey City, N. J., died March 30, in Norwich, Vt., where he had gone to recuperate.

Mr. Robert S. Rathbun, city engineer at Allentown, Pa., is now a member of the Lehigh Engineering Co., at Allentown.

Messrs. Arthur S. Bartlett, E. S. Meeker, and M. McMahen, have been appointed park commissioners at Binghamton, N. Y.

Mr. Willard M. McEwan will succeed Mr. C. S. Deneen, who has resigned, as attorney for the Sanitary District of Chicago.

Mr. John Kemp, consulting engineer of the water-works company, Winnepeg, Man., was caught in a fly-wheel, recently, and killed.

Mr. Merritt Ross has been appointed assistant inspector of sweeping and sprinkling, at Indianapolis. The office is a newly created one.

The new board of public works at Kansas City, Mo., consists of President Graham and Messrs. Baer, Youmans and Hardesty.

Mr. Joseph Earnshaw, of Earnshaw & Punshon, landscape engineers at Cincinnati, has recently been in California on professional work.

Mr. Alfred T. White, ex-commissioner of city works, Brooklyn, N. Y., addressed the Manufacturers' club recently, on "Brooklyn's Water Supply."

Mr. E. H. Shipman has been elected city engineer at Atlantic City, N. J. Mr. Shipman was formerly borough engineer at South Bethlehem, Pa.

Mr. George Kimball has resigned his position as superintendent of streets at Watertown, Mass., and will act in that capacity at Manchester, Mass.

Prof. William H. Burr has been appointed consulting engineer in charge of the completion of the Harlem River Driveway at New York city.

Mr. A. H. Steele, who has resigned his position as deputy commissioner of public works, in New York city, will be succeeded by Mr. Howard P. Wilds.

Mr. Harry C. Barr has been elected mayor at Altoona, Pa., to succeed Mr. S. M. Hoyer.

Mr. Eben W. Jones has been elected water commissioner for three years, Mr. A. J. Wallbridge for two years, and Mr. Thomas B. Tucker for one year, at Peterboro, N. H.

Mr. E. P. Boynton has been appointed city engineer for the ensuing year at Cedar Rapids, Iowa, and Mr. Charles Weare has been appointed chairman of the board of public works.

Mr. Willard F. Gleason has been elected chairman of the board of water commissioners at Holbrook, Mass. Mr. F. G. Morse has been elected clerk and superintendent of the board.

Prof. E. A. Fuertes, M. Am. Soc. C. E., director of the College of Civil Engineering of Cornell University, Ithaca, N. Y., who has been in Europe for a year, has returned to this country.

Mr. R. B. Howell, city engineer at Omaha, Neb., finding that his duties as city engineer require all his time, has resigned his position as state engineer and secretary of the state board of irrigation.

Mr. Frank P. Johnson, recent city engineer at Waltham, Mass., has entered business as a constructing and consulting civil engineer, under the firm name of Aab & Co., at 53 Tremont st., Boston, Mass.

Dr. Henry P. Walcott, chairman of the Massachusetts State Board of Health, has been nominated a member of the Metropolitan water board, Boston, Mass., to succeed Mr. Charles A. Allen, who resigned.

Mr. Harvey Linton, M. Am. Soc. C. E., was re-elected city engineer for three years, April 13, at Altoona, Pa., by the unanimous vote of the city council. This is Mr. Linton's fourth term as city engineer.

Prof. T. R. Fava, M. Am. Soc. C. E., died at Washington, D. C., March 27. He was professor of civil engineering at the Columbian University, Washington, and a member of the firm of Fava & Co., consulting engineers.

Mr. J. A. L. Waddell, M. Am. Soc. C. E., Kansas City, Mo., delivered, during April, four lectures—two on the science of bridge building and two descriptive of bridges already built—before the students of McGill University, Montreal, Canada.

Mr. O. M. Lane, for a number of years superintendent of the Plymouth Water Co., at Plymouth, Pa., has been appointed general manager of the syndicate recently formed, to control and operate the waterworks systems at Wilkes Barre and adjoining towns.

Mr. Charles S. Magowan, assistant professor of the University of Iowa, was not a candidate for re-election as city engineer of Iowa City, as he wished to give his entire time to his duties in the University. Mr. A. J. Cox now fills the position of city engineer.

Mr. Edward Meisenhelder, councilman from the fourth ward, has been elected mayor at Marietta, Ohio. Mr. S. J. Hathaway has been elected president of the council, and Mr. Jacob Rich vice-president. Messrs. Philip Bachman, C. E. Garrison, B. F. Wood, Jas. McClure, J. C. Hardy, F. A. Brennan, R. L. Moore, John Price and Mr. Henry compose the rest of the council. Mr. W. P. Mason succeeds Mr. Frank E. Gates as city engineer.

MACHINERY AND TRADE.

The purchase of a stone crusher is contemplated at Dexter, Me.

The town of Poygan, Wis., has voted to purchase a road machine.

Efforts are being made at Owen, Ill., to raise funds to purchase a road roller.

The purchase of a 15-ton steam road roller is contemplated at Jersey City, N. J.

An appropriation of $3,500 has been made for a road roller at Somersville, Mass.

The citizens of East St. Louis, Ill., contemplate the purchase of a steam road roller.

The advisability of purchasing a street sprinkler will be considered at St. Augustine, Fla.

The street committee, Warren, Ohio, was authorized, April 9, to obtain prices on street sprinklers.

At a recent town meeting in Winnebago, Ill., the citizens voted almost unanimously to purchase a rock crusher.

The Clover Creek Limestone Co., Pittsburg, Pa., contemplates opening three large quarries in Blair county.

The Combined Manhole and Catch-basin Co. has been incorporated, at Chicago, by D. C. Dunlap, P. V. Castle and A. B. Williams.

The Totten & Hogg Foundry Co., Pittsburg, Pa., will build a roll train and equipment for the Wyoming Shovel Co., Wyoming, Pa.

A test of road machines is being made, preliminary to purchasing, at Suffolk, Va. Walter Jordan is chairman of the board of supervisors.

The order appropriating $3,500 for the contemplated purchase of a new steam road roller at Waltham, Mass., has passed to a second reading.

Commissioner Bostwick, of the street cleaning department Baltimore, Md., has asked for $1,200 to purchase two new street sweeping machines.

Bids will be received until May 12, at Edna, Texas, for a 16-horse-power traction steam engine and road grader. John O. Rowlett, county judge.

The purchase of a new set of wheels for the road-roller is contemplated at Newburyport, Mass. Superintendent Pritchard estimates the cost at $318.

The Asphaltum Oil Refining Co. has been incorporated at Los Angeles, Cal., by Geo. Clark, of Redbank, and E. L. Doheny and Samuel Cannon, of Los Angeles.

The Patton Clay Manufacturing Co., Dubois, Pa., which recently commenced the manufacture of brick, contemplate manufacturing sewer pipe and other clay products.

The plant of the Indiana Paving Brick Co., Brazil, Ind., has been sold to the Indiana Bermudez Co. The works, which have been idle for some time, will be started at once.

Messrs. W. H. and J. W. Nipples, of Buffalo, N. Y., have established in Meadville, Pa., the Keystone Paving Co., which will manufacture and lay stone cement pavements.

The Southern New England Asphalt Paving Company has begun the erection of their new asphalt plant at Cott's dyke, Hartford, Conn., preparatory to paving Main st.

The United States Asphalt Paving Co., New York city, has been incorporated by William J. Wilson, of Albany, and Burtin M. Lawler and Henry P. Mulraney, of New York city.

Bids are invited at Norfolk, Va., until May 20, for furnishing and delivering cement, broken and dimension stone at Fort Monroe, Va. Capt. Thos. L. Casey, U. S. engineer.

The asphalt plant of the Fruin-Bambrick Construction Co., Peoria, Ill., was burned March 29. The building was filled with machinery, mixers, etc., and all were more or less damaged.

The Southern Asphalt Paving Co., Baltimore, Md., has been incorporated in West Virginia, by J. L. Blackwell, H. B. Keyser, David G. Evans, A. L. Shreve and Ed. H. Rich, of Baltimore.

The common council at Kingston, N. Y., ordered the purchase, recently, of a stone crusher and engine at a cost of $1,847, and of two patent wagons to spread crushed stone on the streets.

The plants of the Kentucky Fire-brick Co., at Portsmouth, O., and Indian Run, Ky., have been sold to the First National Bank of Portsmouth, but the management will remain the same.

The McPhee Co. has been incorporated at San Francisco, Cal., to construct roads, railways, bridges, etc., by Daniel McPhee, John Groliere, James Sutton, and Wm. E. Lowe, of San Francisco.

An ordinance has been introduced at Everett, Mass., authorizing the board of public works to purchase a steam road roller, the cost not to exceed $3,500. The ordinance was referred to the committee on streets.

The Boston Paving Co., Boston, Mass., has been incorporated by Geo. H. Cutting, Chas. A. Richardson, and Chas. B. Duffy, of Boston. The company will deal in paving and roofing materials.

The Jamestown Shale Paving Brick Co., Jamestown, N. Y., has resumed operations. The company contemplates increasing the capacity of the plant to 35,000 paving brick daily during this season.

A brick plant will be established at Cedar Rapids, Iowa, by Henry Bosler, who contemplates putting in late improved machinery and having the plant in operation in about sixty days.

The purchase of a street sprinkler is being agitated, at Centerville, Ia., by George Strickler, who proposes the purchase of a street sprinkler of the latest design, which will hold 600 gallons of water.

The plant of the Pioneer Paving Brick Co., of Galesburg, Ill., has been sold to J. B. Carroll, of Rockford, Ill., for $6,050; the bonded indebtedness is $69,000. and the certificates due amount to $36,000.

The Frey-Sheckler Co., Bucyrus, O., has been awarded damages in a suit brought against the Iowa Brick Co., of Des Moines, Ia., for payment on a Bucyrus dryer. The court awarded the company $6,000.

The Purington Paving Brick Co., Galesburg, Ill., has decided to substitute coal for oil for fuel purposes, and the kilns of the company's plant are being prepared for the change. The increase in the price of oil is the cause of the change.

At a recent meeting of the citizens of Whitemarsh township, Montgomery county, Pa., the purchase of a stone crusher was advised but no action was taken. The increased taxation that would result caused opposition to the proposition.

McCabe & Son, Rushville, Ill., are preparing to build a new patent down-draft kiln, 22 feet in diameter, and with a capacity of 50,000 brick. While the kiln is being built to burn paving brick, yet it may be used for tile-burning or even common brick.

A. Brazos & Sons, Middletown, Conn., contemplate establishing a stone-crushing plant at Reed's Gap. A portion of the mountain situated on the west side of the Air Line railroad has been leased, and a spur track will be run from the mountain to the main line.

The Central Sewer Pipe Co., Pittsburg, Pa., has a contract with the Mexican government for 125 miles of sewer pipe for the city of Mexico, for which appropriation of $15,000,000 has been made. This is the largest sewer pipe contract that has ever been made in this country. More than 2,000 cars, or a solid train of 16 miles, will be required to transport the pipe to Mexico.

Sealed proposals will be received until May 9, at Brunswick, Me., for furnishing 70,000 brick, 200 barrels of Rosendale cement and 100 barrels Portland cement, manhole castings, and 48 sets of frames and curves. Ernest W. Bowditch, 60 Devonshire street, Boston, engineer.

The United Paving Companies, San Francisco, Cal., have been incorporated to construct bridges, sewers, pavements, railroads, etc. Interested partise are: Wm. M. Bryant, Los Angeles; E. R. Thompson, Daniel Suter, and Joseph M. Cummings, San Francisco; Francis Avery, Sansolito.

Messrs. Eugene Schoolcraft and Aaron Lang are forming a company to manufacture vitrified brick, at Port Huron, Mich. The success of the Port Huron Petrified Brick Co., which began operations last spring, has encouraged the promoters of the contemplated industry.

The articles of agreement of the Medina Stone Co., Medina, N. Y., have been signed by forty Orleans county quarry-owners, operating fifty quarries and employing about 1,500 men. While not in the nature of a trust, it is said that the arrangement will do away with rivalry and reduce the operating expenses in certain directions.

The board of county freeholders, met at Newark, N. J., April 9, and asked that a committee of five be appointed to consider the advisability of purchasing a steam stone crusher for use at Caldwell penitentiary. Messrs. Condit, Van Geisen, Krueter, Atchason, and Owry, were appointed to report on the matter.

The purchase of a steam road-roller for rolling macadam roads is suggested at Albany, N. Y., by Patrick H. Riley, a paving contractor, who says that if the city had one, it could sub-let it to those contractors who do not own a roller. No money is available for the purpose, however, this year, but an appropriation may be made next year.

The Columbia Improvement Co., of Syracuse, N. Y., has elected officers as follows: President, Chas. M. Warner; first vice-president, Hendrick S. Holden; second vice-president, Wm. Kirk; secretary, treasurer and general manager, W. H. Gallup. The company is a kind of branch of the Syracuse Improvement Co. It will import its own asphalt, which will be refined in Brooklyn and shipped as required.

The Pittsburg Terra Cotta Co. has purchased of the Frey-Sheckler Co., Bucyrus, Ohio, machinery for the Terra Cotta Co., whose works are being built within forty miles of New York city, as follows: One Bucyrus Special Giant; one No. 2 Giant; two 14-foot pug-mills; two 9-foot dry pans, screens, elevators, and shafting; one Hamilton Corliss engine and boiler, 250 horse power; one Bucyrus Steam Tunnel Dryer; 20 tunnels.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

St. Paul, Minn.—The Assyrian Asphalt company has been admitted to competition with the Trinidad and Bermudez asphalt companies.

Worcester, Mass.—The highway committee left April 8 to inspect asphalt paving in Albany, Buffalo and New York City.

San Francisco, Cal.—The construction of plank sidewalks in any part of the city has been prohibited by the street committee of the board of supervisors.

Columbia, S. C.—(Special.)—J. F. Walker, city clerk, says that no contracts are to be let for municipal improvements, and no purchases of road machinery are now contemplated.

Chicago, Ill.—Suit for $50,000 has been brought against M. A. Prussing for alleged libel in stating in a letter given out for publication that City Engineer Jackson favored the passage of a paving ordinance for which a corruption fund had been raised.

Galesburg, Ill.—M. J. Blanding, city engineer, is in receipt of a letter from E. E. Ellis, manager of the Daily Telegram at Cairo, Ill., asking for information regarding the city's block pavements. Mr. Ellis is endeavoring to awaken interest in the matter at Cairo.

Taunton, Mass.—The Gazette says that "if Court-st. is to be paved, and that seems to be apparent, many citizens would like to see asphalt tried on the section which passes the court house."

Des Moines, Ia.—A list of outstanding contracts for this spring and summer includes nine contracts for grading, three for curbing, seven for brick paving, two for sewers, one for repairing and resetting curbing, and one for street sweeping. The prices of the paving range from $1.27 to $1.68 per sq. yd.

Milwaukee, Wis.—The board of public works, while looking up some of the old pavements which will be replaced with asphalt, has found that they cost more than the asphalt paving will. This is particularly true of the old limestone pavement on E. Water and Market Square, where the first cost exceeded that of asphalt.

Newark, N. J.—Bids were invited until April 30 for asphalt paving for Cedar, Walnut, Lincoln Park, Eagle and Astor-sts, and Pennsylvania-ave.; brick, Linden-st.; granite blocks, Seventh-ave. and High-st. Ordinances have been ordered to a third reading for paving and repaving as follows: Granite, Taylor-st.; Johnson-ave.; asphalt, Elizabeth-ave.

Wellsville, N. Y.—(Special.)—G. Eugene Farnum, city clerk, says that there has been some talk in regard to paving the streets, but it is not probable that anything will be done this season.

New Orleans, La.—(Special.)—After a long contest here, involving columns of newspaper articles and much discussion, a general street paving ordinance has been passed, one clause of which reads as follows: "That in future bids will be received for Pitch Lake asphalts only, and that all specifications and advertisements for bids for asphalt pavements shall contain a clause to that effect."

New Orleans, La.—(Special.)—The Abbott-Gamble contracting company of St. Louis, Mo., has just finished a contract for 12,000 square yards of brick paving, having used Mack Shale brick. The work was completed within six weeks, and the firm received a resolution signed by the property-owners expressing their recognition of the speed with which the work was carried on and the thoroughness with which it was executed.

Chicago, Ill.—In the mandamus proceedings against Commissioner Kent and the city to compel the former to award a paving contract to the Assyrian asphalt company, the lowest bidder, the supreme court affirmed the action of the lower court in awarding it to the Barber asphalt company.

East Orange, N. J.—The township committee has recommended an increase from $16,000 to $20,000 in the annual appropriation for street maintenance, and a special fund of $5,000 for the purchase of road machinery, etc. At the organization of the township committee, April 20, President Joseph P. Thompson recommended the purchase of a steam road roller and pick, and suitable carts for use on the streets, and urged the necessity of more flush tanks in the sewers, stating that where there should be 100 there is only 16 now.

Brooklyn, N. Y.—City Works Commissioner Willis says that streets are under contract this season as follows: Cranford & Co., Trinidad asphalt, forty-six; Brooklyn Alcatraz company, four; Bermudez asphalt company, four; Fruin-Bambrick construction company, one. In addition the board of aldermen has authorized the making of contracts for repaving twenty-eight other streets. Proposals will probably be asked soon for repaving with granite portions of Ralph and Saratoga-aves. and Willoughby and Livingston-sts. One important improvement is the repairing of Washington-ave., from Flatbush to Classon-ave., with vitrified brick.

Portland, Ore.—A sample of a new wood paving block, patented in California, has been submitted to Superintendent of Streets Gradon for inspection. The blocks are 3x6x6, and eight of them make a block of pavement 12 inches square and six inches thick. The blocks were held together by pitch or asphalt pressed between and over them. The

two samples of wood block pavement laid at Third and Yamhill-sts. and at Second and Washington-sts., after a year's trial, show but little signs of wear, and it is probable that more of the material will be laid this season.

Los Angeles, Cal.—The supreme court holds the bond act constitutional, as decided by the superior court. Under this act thousands of dollars of street improvements have been done, and it is supposed that the decision will now hasten the paving of Main-st., for the contractors will have no further reason for prolonging the delay. The suit was brought by a property-owner to enjoin the city treasurer from selling certain property for payment of street improvement costs. Judge Shaw of the superior court decided in favor of the defendant. The appeal to the supreme court was then taken.

Chicago, Ill.—The Chicago Post, in commenting on the bids received April 11 and 13 for paving, says:

"For three years prices have been steadily pulled down until, it is believed, the lowest notch has been reached. Special assessment improvements were made last year 33 1-3 per cent. cheaper than during the preceding year. That this year's prices fall still lower caused the greatest surprise. The reductions are due to competition and the great number of bidders for city street work. The report made to Commissioner Kent is based upon the bids submitted last Saturday and Monday on 36 streets to be improved at once. They were the first to be advertised this year, and the result is most favorable to the city. The following figures show the average of the three lowest bids on all kinds of paving submitted this year, and an average of the same number of the lowest proposals made on similar work a year ago:

	1895.	1896.
Cedar block	$0.91 9-13	$0.89 3-16
Brick	1.95	1.57 1-3
Macadam	.72 3-10	.68
Asphalt	2.25	1.85
Stone curb	.65	.58

Wilkinsburg, Pa.—Last summer $160,000 was expended for paving the streets, but most of the work will have to be done aver again. Ffteen of the streets were paved with fire brick, and, without an exception, all have sunken, either entirely or in places. One of the reasons assigned for the failure of the paving is sewers that were constructed in 1894. The weather was very dry, and the soil being so hard was not packed as well as it would otherwise have been, and there has been very little wet weather since until this winter and this spring, when the excessive moisture caused the paving to sink. Some of the contracts with the paving companies call for repairs for a year, and the cases not covered in this way will be cared for by the borough.

CONTEMPLATED WORK.

Ambler, Pa.—The issue of paving bonds is contemplated.

Oneida, N. Y.—About 5,000 sq. yds. of brick paving is contemplated.

Cumberland, Md.—N. Mechanic-st. will be paved with vitrified brick.

Evansville, Ind.—Portions of a number of streets will be paved with brick.

Lapeer, Mich.—This city has voted to bond for $6,000 for street improvements.

Greensboro, N. C.—Bonds will be issued to the extent of $15,000 for street improvements.

Loveland, Col.—Plans have been formulated for building about 20 miles of a wagon road.

Charleston, S. C.—Asphalt paving is contemplated for King-st. Col. E. S. Gadsden, Chrmn. Com.

Macomb, Ill.—Brick paving is contemplated for the public square and some of the streets.

Easton, Pa.—Vitrified brick paving is contemplated for Center Square.

Louisville, Neb.—Macadam is being considered for the old sand road.

Ft. Dodge, Ia.—About nine blocks of paving is contemplated for Central-ave.

Somerville, Mass.—Bids will be asked for furnishing paving blocks for two streets.

Medina, N. Y.—An appropriation for extending the system of macadamized roads is contemplated.

Haverhill, Mass.—The street committee has in contemplation the macadamizing of upper Main-st.

Wellston, O.—About 10,000 sq. yds. of brick paving will be done this year.

St Charles, Mo.—Main-st. will be paved with brick for a distance of seven blocks.

Harrisburg, Pa.—An appropriation has been made for repairing the asphalt paving on Market and Third-sts.

California, Pa.—Preliminary steps are being taken toward securing sewers and for paving and sewering.

Argentine, Kas.—A macadamized boulevard from this town to the new Turner bridge, at Turner, is being considered.

Saratoga, N. Y.—Subscriptions are being solicited for aid in building a bicycle path between this city and Glens Falls.

Worcester, Mass.—Asphalt paving is being considered for Mechanic, Foster and Waldo-sts. as a test of the material.

Council Bluffs, Ia.—Home-made vitrified brick is now favored for Pearl-st. There will be about 9,000 sq. yds. of paving.

Ridley Park, Pa.—A petition is being signed for opening, grading and macadamizing Ridley-ave., from New-st. to the borough line.

Portland, Ore.—A petition is being circulated for a wood block pavement on a 6-in. concrete foundation on Fourth-st.

Port Clinton, O.—Third-st., from Madison to Lakeview cemetery, will be graded, drained, curbed and paved with brick. J. H. Faus, Clerk.

Three Oaks, Mich.—The citizens have voted to expend $1,000 for gravel to be placed on the roads leading to town.

Bridgeport, Conn.—Fairfield-ave., between Main and Courtland-sts., and State, between Broad and Courtland, will be paved with asphalt.

Bloomington, Ill.—(Special.)—W. P. Butler, city engineer, says that a contract will probably be let for another mile of brick paving.

Mankato, Minn.—The property-owners on Front-st. will petition for paving.

Portland, Ore.—A petition will be made for paving Fourth-st. with wooden blocks 4x8x5 inches, on a 6-in. concrete foundation.

Racine, Wis.—(Special.)—O. Burlingame, city engineer, says that $75,000 will be expended this season on paving.

Albany, N. Y.—Repressed vitrified brick paving, with curbing, is contemplated for First-st., from Hawk to Lark.

Madison, N. J.—The issue of bonds for macadamizing was considered April 24 by the council and citizens.

Marion, Ind.—(Special.)—John Watts, city clerk, says that the streets surrounding the public square will be paved with brick.

Annapolis, Md.—An appropriation bill is in the senate which provides for paving certain streets above the Academy.

Winchester, Ill.—The macadamizing of the Jersey Ridge road is contemplated this summer at a cost of $4,000.

Lowell, Mass.—The wheelmen in the Highlands are signing a petition for asphalt paving in Westford-st.

Quincy, Mass.—It is suggested that Hancock-st. be widened, straightened, regraded and paved, and brick sidewalks constructed.

Astoria, Ore.—The city council is discussing the question of raising the grade of Commercial-st. two feet.

Stevens Point, Wis.—Macadam paving is being considered for portions of Main, Clark and Division-sts. and Strongs-ave.

Saginaw, Mich.—Plans and specifications have been ordered prepared for cedar block paving on Genesee-st., from Janes to Hoyt.

Council Bluffs, Ia.—A petition was presented to the council April 9, by Leonard Everett, asking for asphalt paving on Pearl-st.

Alexandria, Va.—The council has been asked to submit to the freeholders, on June 2, the question of issuing bonds for paving and sewers.

Scranton, Pa.—Ordinances have been introduced in the common council for paving Ninth, Robinson and Jackson-sts. with Belgian block. Estimated cost, $35,000.

Montclair, N. J.—The town council has recommended for top dressing the following streets: Union and Chestnut-sts., Orange road, Valley road and Cliffside-ave.

Allegheny, Pa.—Ordinances have been passed authorizing the advertising of bids for curbing and paving Parkview-ave. and Frazier-st. Robert McAfee, Director.

Davenport, Ia.—Paving is contemplated for this season as follows: Fourth-st., four blocks; High-st., 1,300 ft.; Grand-ave., 540 ft.; also three alleys.

Racine, Wis.—The property-owners on College-ave., from Water to De Koven-st., nearly one and one-half miles, favor brick paving on macadam foundation.

Syracuse, N. Y.—The adoption of a resolution by the common council ordering the compulsory paving of Salina-st., from Butternut to Onondaga, is favored by Alderman Freeman.

Yonkers, N. Y.—A list of 14 important streets in need of improvement has been submitted to the city by S. L. Cooper, Commissioner of Public Works.

Atlanta, Ga.—The citizens on Capitol-ave. are evenly divided on the question of repaving, one-half favoring asphalt paving and the other hadf favoring the repairing of the present pavement.

Laporte, Ind.—(Special.)—Hiram Burner, city engineer, says that this city will pave, with brick on broken stone foundation, about 14,000 sq. yds. with stone curbing, etc.

Denver, Col.—The paving of Justina-st. with asphalt is favored. A petition is being circulated for paving Fairview-ave., between Goss and Gallup-aves., with macadam.

Chester, Pa.—The property-owners on Kerlin-st., between Ninth and Eleventh, contemplate presenting a petition to council for vitrified brick paving in those two blocks.

Westchester, Pa.—(Special.)—Wm. S. Underwood, borough treasurer, says that the paving of Union-st. has been ordered. The borough has all the facilities for completing the work.

North Hempstead, N. Y.—This town has voted to expend $48,000 in the extension of the system of macadamized roads. The work will be done under the supervision of the highway commissioners.

Defiance, O.—Petitions are being circulated asking for fire brick paving on Holgate-ave. and Jefferson-st. The city has several miles of fire brick streets, which have given perfect satisfaction.

Yardley, Pa.—(Special.)—There has been no ordinance passed in regard to the paving of streets as yet, but perhaps there will be in the near future. No other improvements are contemplated.

Brazil, Ind.—A special election will be held May 15 to vote on constructing 20 miles of macadamized roads near Clay City. A gravel road, ten miles long, is proposed through Posey township, and other roads will be looked after.

St. Paul, Minn.—A preliminary paving order has been passed for paving Fifth-st., but the material is not specified. The board of public works will ask the council, however, to authorize the board to advertise for three sets of bids, viz., asphalt, brick and sandstone.

Baltimore, Md.—The ordinance appropriating $40,0000 to pave Mt. Royal-ave., from Dolphin-st. to North-ave., has been signed by the mayor, who has also signified his intention to sign the ordinance to appropriate $30,000 for repairing and repaving Fulton-ave. and for paving McCulloch-st., between Eutaw and Bidd'e-sts.

Utica, N. Y.—Preferences for paving to be done this season have been canvassed in the surveyor's office. Asphalt is favored on South-st. and Taylor-ave. The designations on Genesee-st. are: North of canal, sandstone, 296 ft.; sandstone or granite, 383 ft.; Bermudez or Trinidad Lake asphalt, 674 ft.; best quality of asphalt, 19 ft. Sopth of canal: granite or sandstone, 560 ft.; Bermudez or Trinidad Lake asphalt, 272 ft.; best quality of asphalt, 368 ft.

Binghampton, N. Y.—(Special.)—H. Ward says that, as far as known, the work to be done this year will be the paving with asphalt of Main-st., from the Chenango river bridge to Chapin-st., and perhaps Washington-st., from Court to Lewis.

Buffalo, N. Y.—A petition has been circulated for paving Niagara-st., from Hertel-ave. to Bird-ave. The property-owners on Niagara-st., between Porter-ave. and Niagara square, have asked for Trinidad asphalt at a cost not to exceed $1.75 per sq. yd.

Hamilton, O.—(Special.)—M. O. Burns, city clerk, says that street paving is being agitated, but nothing definite has been done as yet, and the material has not been decided upon, as all favor competition. The city has a road roller which it will sell cheap.

St. Paul, Minn.—Preliminary orders have been passed for paving Robert-st., from Third to Eighth, and for Fifth, from Wabasha to Broadway. Final orders have been passed for paving Sixth-st., from Isabel to Rosabel and Oakley-ave., with asphalt.

Sioux City, Ia.—A committee has been appointed to circulate a petition to remove the cedar blocks on Seventh-st. and pave with asphalt. The committee comprises Messrs. J. G. Herrmann, John Holdenreid, J. D. Patten, Louis Kettleson and Frank Wilson. Paving is being considered for Fourth-st. also.

Detroit, Mich.—A resolution has been adopted in the common council ordering that Cass-st. be paved with brick on concrete, with Medina or North river blue stone curbing; Pine-st. with cedar blocks on concrete; Watson-st., cedar blocks on concrete; Division-st., cedar blocks on concrete.

Marietta, O.—(Special.)—S. J. Hathaway, president of the city council, says that several streets are in process of preparation for paving. The best vitrified repressed brick will be used, without tar, as the city prefers pavement without tar. Third-st. will be advertised soon and put under contract.

Grand Forks, N. D.—An initiatory step toward securing improved streets has been taken by the Brickmakers' association. Experiments have already been made that have convinced the brickmakers that by using a mixture of clay taken from near Langdon and the clay that is found here a good vitrified brick, suitable for paving, is made. Tests will be made, and if found to meet the requirements the association will, at its own expense, pave the square at the intersection of Third-st. and Demers-ave.

Cedar Rapids, Ia.—While no preliminary arrangements have been made and no contracts let, yet is is known that considerable paving will be done. All of the block paving, which was laid eight years ago, will be taken up and replaced with brick or some other material, with the exception of the portion of First-ave., between Tenth and Thirteenth-sts., which is in fair condition. A petition is in circulation among the property-owners on First-ave., particularly between Fourth and Tenth-sts., asking for asphalt paving.

Westerville, O. — (Special.) — C. R. Sprague, village clerk, says that the only street paving talked of at present is a part of one street, about one-eighth of a mile in extent, with brick. A petition is being circulated to get the required foot frontage, but there is nothing to indicate that it will prove successful.

San Francisco, Cal.—Thomas Ashworth, superintendent of streets, has recommended to the board of supervisors a large amount of new street work, consisting of bituminizing, macadamizing and curbing, but owing to the shortage of the funds in the city treasury the work will probably be postponed until the opening of the next fiscal year.

Utica, N. Y.—An experiment will be made at East Utica by building an asphalt towpath for a distance of 500 or 800 feet along the canal in an effort to save the water in the canals which now seeps through the stone and earth embankments. The plan calls for the digging of a trench about 2 ft. deep at the foot of the walls and the building of a sloping bank to the top of the towpath. The layer of asphalt will be about 2½ to 4 inches thick. The successful use of asphalt in lining reservoirs leads to this experiment.

Indianapolis, Ind.—Resolutions have been adopted for paving as follows: Asphalt, Alabama-st., from Ft. Wayne-ave. to Morris-st.; brick, alley east of Meridian-st., alley east of Pennsylvania-st. and alley east of Delaware; Shelby-st. from Pleasant run to Raymond-st.; Morris-st., from East-st. to White river; Alabama-st., from Morrison to Seventh. Final action has been taken on the following resolutions: Asphalt, Senate-ave., from Washington-st. to Kentucky-ave.; brick, Michigan-st., from Indiana-ave. to East-st. Maryland-st., from Kentucky-ave. to West-st., will be paved with brick.

CONTRACTS TO BE LET.

Davenport, Ia.—Bids will be acted upon May 16 for about 1,550 feet of street paving.

Youngstown, O.—Sealed proposals will be received until May 9 for constructing cross walks and sidewalks. H. W. Calvin, clerk.

Terre Haute, Ind.—Proposals will be received until May 5 for paving with cement concrete Seabury-ave. Charles H. Goodwin, city clerk.

Laporte, Ind.—Sealed proposals will be received until May 18 for constructing 14,000 square yards of brick pavement. Hiram Burner, city engineer.

San Francisco, Cal.—Bids will be advertised in July for bituminizing Folsom-st., from Third-st. to the bay.

Mansfield, O.—Sealed proposals will be received until May 16 for improving Augustine-ave. F. M. Remy, city clerk.

New Brunswick, N. J.—Bids will probably be asked in May for curbing and flagging in Somerset-st. Asher Atkinson, city engineer.

Leipsic, O.—Sealed proposals will be received until May 2 for improving Defiance-st. Bond not less than $5,000. G. C. Shiffer.

Ithaca, N. Y.—(Special)—Bids are asked until May 12 for 15,000 square yards of brick paving. H. M. Hibbard, superintendent paving committee.

Muncie, Ind.—Sealed proposals will be received until May 4 for improving streets, alleys and sidewalks. Check, $50. F. A. Elrod, city clerk.

Caledonia, Minn.—Sealed bids will be received until May 11 for macadamizing Kingston-st., between Grove and Washington-sts. John Boquet, village recorder.

Brooklyn, N. Y.—Sealed proposals will be received until May 4 for paving Thirty-third-st., from Third to Fourth-aves., with cobblestone. Theodore B. Willis.

Litchfield, Conn.—Sealed proposals will be received until May 4 for building a section of telford road on West-st. Bond, $1,000. Chas Merriman, selectman.

Ridgefield, Conn.—Sealed proposals will be received until May 4 for grading and macadamizing a section of the main street. Bond, $1,000. John Brophy, selectman.

New Ulm, Minn.—Bids are invited until May 5 for graveling, sewering and boulevarding State-st., from Second to Sixth. Check, $50. Louis Schilling, city clerk.

Cincinnati, O.—Sealed proposals will be received until May 5 for grading, setting granite curb and paving with brick Gorman and Elm alleys. A. P. Butterfield, clerk B. of A.

Buffalo, N. Y.—Sealed proposals are invited until May 5 for a flagstone walk on both sidewalks of Front-ave., for a distance of about one and a half miles. William McMillan, park superintendent.

Toledo, O.—Sealed proposals will be received until May 20 for constructing stone road No. 23 by grading, draining, bridging and macamadizing. Check, $100; bond, $2,000. Charles H. Jones, county auditor.

Cincinnati, O.—Sealed proposals will be received until May 7 for paving with brick and setting granite curbs, White and Essex alleys. A. P. Butterfield, Clerk B. of A.

Cincinnati, O.—Sealed proposals will be received May 11 for macadamizing certain portions of Madisonville-ave. and setting and resetting curbs, crossings and gutter flagging. August Herrmann, President B. of A.

Jefferson Barracks, Mo.—Sealed proposals will be received until May 13 for constructing a macadam road, twenty-five feet wide, with necessary gutters and drainage. Sam R. Jones, Captain, Acting Q. M.

Albany, N. Y.—Sealed proposals will be received until May 4 for paving with Trinidad asphalt, on the present granite pavement, Maiden lane, from Broadway to Pearl. Also for building receiving basins. Thomas J. Lanahan, Clerk.

Boston, Mass.—Sealed proposels will be received until May 7 for building section 6 of the subway in Tremont-st., from Park-st. to Scollay square. The work involves 28,000 cu. yds. of earth excavation, 125 tons of iron and steel work, 100 cu. yds. of brick masonry, Rosendale cement mortar; 2,600 cu. yds. of brick masonry, Portland cement mortar. Certified check, $6,000 B. L. Beal, Secretary Boston Transit Commission.

Wilkinsburg, Pa.—Sealed proposals will be received until May 2 for paving with vitrified brick, Hill, Wallace, South, Ross, Rebecca and McNair-aves. and Meadow, Pitts and Ella-sts.; paving, 57,000 square yards; curbing, 35,000 lineal feet. Edeburn & Cooper, Borough Engineers.

Dayton, O.—Sealed proposals will be received until May 7 for repairing with stone flagging, cement or asphalt, the sidewalks on State, Walnut, Meigs, Wyoming, Pearl, Joe and Jefferson-sts. Also for grading and paving six alleys. C. A. Herbig, Comptroller.

Windsor, Conn.—Sealed proposals will be received until May 4 for macadamizing about 1,600 feet of road called Hayden station, also about 2,000 feet of a section of road from S. J. Mill's, northerly. T. S. Loomis, Selectman.

Columbus, O.—Sealed proposals will be received until May 7 for grading and paving with asphalt, stone, block or any kind of manufactured first-class repressed block, fire-clay or hard-burned brick, and setting a five-inch curb of Berea, Fulton and Sunbury or Iberia stone, Loraine and Hayden-aves. Certified check $100 each. James A. Fanning, Clerk.

New Castle, Pa.—(Special.)—Sealed proposals will be received until 10 o'clock, May 4, for grading, paving and curbing about 40,000 square yards of streets with asphalt block, as follows: Highland-ave., Water-st., Long-ave., Croton-ave. and Wallace-ave. Certified check, $500. Frank Tidball, City Clerk.

Bloomington, Ind.—Bids will be received until May 27 for the construction of free gravel roads as follows: Bloomington and Unionville road; Bloomington and Brummets Creek road; Bloomington and Elletsville road; Bloomington and Vernal Church road; Bloomington and White Hall road; Elletsville and Spencer road; Harrodsburg and Smithville road. J. M. Hinkle, County Auditor.

Dayton, O.—Sealed proposals will be received until May 6 for paving Brown-st., from Fairground-ave. to Hughes-st., with Medina, Hayden, Nelsonville, Hallwood, Wassail Hallwood, Logan Hallwood, East Clayton, Athens, Nelsonville, Logan, Hocking or Mack block, asphalt block or sheet asphalt, and furnishing and setting new curbs. Check, $5,000. C. A. Herbig, City Comptroller.

CONTRACTS AWARDED.

Little Rock, Ark.—W. H. Woodsmall was awarded the contract for improving W. Second-st. for $2,541.

Albany, N. Y.—The contract for paving Elberon-place with brick was awarded to Patrick H. Reilly for $7,494.14.

New York, N. Y.—Bart Dunn, 321 E. Sixty-eighth-st., presented the lowest bid for regulating and grading Tremont-ave., from Jerome to Aqueduct-ave.

Lansing, Mich.—The contract was awarded April 10 to George Keith & Son of this city for 41,807 square yards of brick paving.

Rochester, N. Y.—The Warren-Scharf asphalt paving company was awarded the contract April 8 for paving N. Fitzhugh-st. with asphalt at $2.50 per square yard.

Meriden, Conn.—The contract for paving W. Main-st. with brick was awarded to J. McMinnimin of Tyrone, Pa., at $2.65 per square yard.

Fredonia, N. Y.—The contract for paving E. Main-st. with Telford macadam, 1,400 feet, was awarded to James Fitzgerald for $10,160.47.

Parsons, Kas.—The contract for grading, macadamizing and curbing Belmont-ave., between Central-ave. and Fourteenth-st., has been awarded to W. M. Noakes for $5,263.32.

Newburyport, Mass.—The contract for furnishing 8,000 feet of edgestones was awarded April 1 to Hooper Harvey of West Sullivan, Me., at 32⅞ cents per foot. For crushed stone, Thomas F. O'Neil, $1.30 gross ton.

Philadelphia, Pa.—Contracts have been awarded for asphalt resurfacing on Broad and Diamond-sts. at $1.17 per square yard to the Philadelphia paving and construction company.

Erie, Pa.—Mayer Bros. have been awarded a contract for paving with Park No. 1 brick at $2.24 per square yard. The Park paving company, Rochester, Pa., bid $2.28 on the same kind of brick.

Buffalo, N. Y.—Bids were received April 14 for paving Guernsey-st. and Sweet and Brooklyn-aves. Two new firms bid on the work, the Rock asphalt company of Rochester and the Trinidad asphalt paving company of this city.

Buffalo, N. Y.—(Special.)—R. G. Parsons, secretary department public works, says that nothing has yet been done with reference to letting the paving contracts for which proposals were received April 14. The matter is still in the hands of the committee.

Indianapolis, Ind.—Paving contracts were awarded April 27 as follows: Paving of Court-st., from Senate-ave. to California-st., Capital paving and construction company, $2.67 per lineal foot, each side; paving Columbia-st. with brick, from Ohio to Michigan, C. L. James, $2.67 per foot, each side.

Sullivan, Ind.—Contracts were awarded April 10 as follows: Grading and graveling new extension of Washington-st., A. B. Thurber, $1.02 per lineal foot; Beech-st., Keegan Bros., $1.30 per lineal foot; paving alley back of Commercial Row, S. H. Alkire, $2.98 per lineal foot.

Scottsburg, Ind.—(Special.)—S. B. Wells, city clerk, says that the contract for macadamizing the streets was awarded to C. F. Deal at $1.93 per foot front, the work to consist of five inches of broken stone and three inches of gravel. No other improvements are contemplated.

Ft. Wayne, Ind.—(Special.)—M. M. Smick, clerk board of public works, says that the contract for paving Pontiac-st. with vitrified brick has been awarded to C. E. Moellering & Co. at $4.43 per lineal foot. Bids were received April 24 for paving Montgomery-st. with brick.

Waterloo, Ia.—The contract for 12,500 square yards of brick paving has been awarded to Kenety & McCann of Dubuque, Ia., at $1.36 per square yard; 5 by 22-inch stone curbing, 49 cents; 5 by 18-inch, 42 cents; 6 by 22-inch cement curbing, 44 cents; 6 by 18-inch, 36 cents. Total, $18,728.

Parkersburg, W. Va.—Bids were opened April 14 for paving Fourth and Market-sts. with brick. The bids which were submitted by Hugo Heydenreich, Otto Lehman, J. V. Carney and C. Skidmore and Con. Kennedy ranged in prices from 84 cents to $1.13, and were on Parkersburg, Athens, Barnard, Globe, Zanesville, Riverside, Stewart, Jones, McMahon & Porter and Ebert bricks and blocks.

Independence, Mo.—Contracts were awarded April 3 as follows: Macadamizing Fairview-ave., A. J. Armstrong, $1.09½ per cubic yard; macadamizing coal mine road, W. C. Rice, 95¼ cents per cubic yard; Spring Branch, Colyer Bros., 89 cents per cubic yard; Independence-ave., from Big Blue to Fairmount park, M. McTiernan, $1.04¾ per cubic yard; Wornall road, 97 cents per cubic yard; grading Independence-ave., Timothy Ryan, 11¾ cents per cubic yard.

Savannah, Ga.—Bids were received April 13 for furnishing vitrified brick for paving S. Broad-st. as follows: Virginia paving brick company, Lynchburg, Va., $1.05 2-3 per square yard; W. B. Harris & Bro., Zanesville, O., $1.22; Tennessee paving brick company, Chattanooga, Tenn., $1.16½ for Reynold's paver and $1.14½ for Robbins brick; W. F. Chaplin, Savannah, Mack brick $1.15 and Catskill shale brick $1.01.

Norfolk, Va.—Bids were opened April 15 for furnishing the city with stone and vitrified blocks for paving purposes. The prices for bricks were 91, 92, 97 and 98 cents, and $1 and $1.03 per square yard, and for stone from $2.70 to $3.15 per square yard. The contract will be awarded early in May and then the work of paving South, County and Glasgow-sts. will begin.

Indianapolis, Ind.—Contracts have been awarded during April as follows: Senate-ave., from Kentucky-ave. to South-st., Daniel Foley, $4.45 per foot, Poston block with Portland cement filling; Vermont-st., from Meridian to Pennsylvania, asphalt, Indiana Bermudez asphalt company, $5.98 per foot; S. West-st., from Washington to South, Indiana standard block, Indiana Bermudez asphalt company, $4.97 per foot. The bids received April 20 for paving Alabama-st., from Maryland to the P., C., C. & St. L. tracks with brick, were rejected because they were too high. One bid was $6.93 per foot and one company bid $6.86 to $6.99, according to the brick used.

Freeport, Ill.—The contract was awarded April 4 for paving Upper Stephenson-st., in West Freeport, with brick to Flick & Johnson of Davenport, Ia., as follows: Springfield repressed brick, $1.10 per square yard; excavating, 12 cents; curbing, 37 cents. Other bids received were A. E. Rutledge, Rockford, paving, $1.05½; excavating, 18 cents; curbing, 42 cents; Thacher & Burke, Chicago, paving and excavating, $1.23; curbing, 35 cents, Kenety & McCann, Dubuque, $15,335 for the entire contract; Tom Rockey, Freeport, paving, $1.40; excavating, 30 cents; curbing, 57 cents; Young & Co., Chicago, entire contract, $15,200.26; J. B. Smith & Co., Chicago, entire contract, $15,380; Peters & Co., entire contract, $15,000.

Ottumwa, Ia.—(Special.)—James King says that paving contracts were awarded April 8 as follows: District No. 13, George Kreichbaum & Co. of Burlington, paving, brick, $1.43 per square yard; extra grading, haul less than 1,000 feet, 1 cent per cubic yard; new stone curbing, 51 cents per lineal foot. For paving parts of districts Nos. 15 and 31, Ottumwa brick and construction company, paving, brick, $1.40 per square yard; extra grading, haul less than 1,000 feet, 25 cents; extra hauling for each 100 feet over 1,000 feet, 1 cent per cubic yard; new stone curbing, 52 cents per lineal foot.

Hartford, Conn.—(Special.)—Sheet asphalt pavements will be laid for the first time within a few weeks, the contract having been awarded to the Southern New England paving company, which uses Trinidad lake asphalt. Their plant is being erected and as soon as frost is wholly gone the pavement will be laid on Main-st. This city, after careful investigation, is laying permanent pavements as a matter of economy, the city having been put to unbearable expense for the maintenance of macadam, which it had endeavored to keep on streets, not only with car tracks, but heavy traffic.

Memphis,Tenn.—Contracts were awarded, April 2, as follows: Brick, Main and Calhoun-sts., Talbott paving company of Detroit, Mich., $1.97 per square yard; two blocks will be laid with Bannon brick, four blocks with Burlington and about seventeen blocks with Tennessee brick. St. Martin-st. will be paved with Novaculite by the city. Other bids received for the brick paving were: M. Larkin, $2.29 per square yard; Tennessee brick, L. T. Kavanaugh, $2.24½, Tennessee brick; T. Brown, $2.50; Tennessee Bannon or Coaldale brick, Dennis Harvey, $2.55; E. Hawley, $2.31 to $2.35, according to the kind of brick; M. J. Roach, $2.49, Tennessee brick; Forrest & Co., $2.27½; Patterson transfer company, $2.36 to $2.60, according to the kind of brick. The bids are the lowest ever received in the city, and the bid of the Talbot paving company particularly was the occasion of much surprise. The bids were opened March 26.

St. Paul, Minn.—Bids were received April 23 for paving Tenth-st. between St. Peter and Cedar-sts. with asphalt. Bids were received from the Warren-Scharf asphalt paving company, E. M. Ayers and Hennessy & Cox. The board of public works will recommend that the contract be awarded to Hennessy & Cox at their bid of $2.45 per square yard or $3,478.44 for the whole. Bids were received also for paving Tenth-st. from Wabasha to Cedar-st. with cedar blocks, and the contract was awarded to Thomas Reilly at $1,386 for the whole.

Peoria, Ill.—(Special.)—A. D. Thompson, city engineer, reports that the bidders on the brick paving contracts on April 23 were J. S. Allen and J. J. Jobst of Peoria, Flick-Johnson construction company of Davenport, Ia.; John Trapp of Dayton, Ky.; A. E. Rutledge of Rockford, Ill.; Bedford, Weikel & Nugent of Evansville, Ind.; Mayfield & Awe of Lincoln, Ill.; McAllister & Dunbar of Peoria, Ill. The lowest bidders on the following streets, with one course of brick on six inches of concrete, were: Monroe-st., 30,422 square yards, J. S. Allen, Peoria, $1.32 for brick, 21 cents per cubic yard for excavation, 5 cents per lineal foot for setting protection curb, 40 cents per cubic yard for fill; total, $44,663.69. Main-st. north to Elizabeth, 4,015 square yards, J. J. Jobst, Peoria, $1.37 for brick, 25 cents for excavation, 6 cents for resetting curb, 60 cents for fill; total, $6,268.34. Main-st. from Elizabeth to Bourland, 7,478 square yards, J. J. Jobst, $1.37 for brick, 23 cents for excavation; total, $11,694.37. Main-st. from Bourland to Bradley, 3,214 square yards, J. J. Jobst, same prices; total, $5,-233.16. Lincoln-ave. from S. Adams to W. Jefferson, 2,213 square yards, Flick-Johnson construction company, $1.36 for brick, 24 cents for excavation, 8 cents for resetting curb; total, $3,397.75, and same on Lincoln-ave. to Olive-st., $5,334.59. Hamilton-st., 3,215 square yards, J. S. Allen, $1.64 for special brick, 29 cents for excavation; total, $5,583.48. Water-st., 3,649 square yards, on eight inches concrete, Flick-Johnson construction company, $1.51 for brick, 20 cents for excavation, 6 cents for setting curbs; total, $5,992.87. Commercial-st., 1,704 square yards, J. S. Allen, $1.35 for brick pavement; total, $1,710.52. The bids on 15,000 lineal feet of cement curb on Monroe-st. were as follows: Granitoid construction company, Chicago, 34½ cents; Louis Drach, Cincinnati, 37 cents; T. J. Wasson, Peoria, 37½ cents; C. DeWitt & Son, St. Joseph, Mich., 46 cents; Peter O'Hair, Sterling, Ill., 47¼ cents; Warren-Scharf asphalt company, 75 cents.

SEWERS.

New Orleans, La.—The proposed construction of the drainage system has been defeated.

Columbus, O.—A temporary restraining order has been granted by Judge D. C. Badger, enjoining the city from purchasing the sewage farm. The suit is brought by Chas. W. Herb, who claims that the dumping of sewage will damage the adjoining property.

CONTEMPLATED WORK.

Lead, S. D.—This city has voted $27,-000 in sewer bonds.

Fon Du Lac, Wis.—Plans and specifications have been ordered prepared for sewers.

Delaware, O.—A petition will be circulated for a sewerage system.

Los Angeles, Cal.—The estimated cost of the Broadway tunnel is $94,480.

Calais, Me.—A sewerage system has been recommended by the mayor.

Pomona, Cal.—The estimated cost of the proposed sewerage system is $21,396.

Carthage, O.—The village council has decided to construct a complete sewerage system.

Manistee, Mich.—About two thousand eight hundred lineal feet of sewers is contemplated for this year.

Wallace, Wash.—A survey for a sewerage system has been completed by Scott Anderson.

Newburyport, Mass.—The issue of $110,000 in bonds, for sewer purposes, has been authorized.

Zanesville, O.—Plans have been adopted for sewers in Orchard, Eastman and Lincoln-sts.

Santa Ana, Cal.—It is probable that the question of a sewerage system will be renewed.

Brunswick, Me. — An appropriation of $18,000 has been made to complete the construction of sewers.

Richmond, Va.—The question of issuing $50,000 in bonds for sewer construction is being considered.

Racine, Wis.—(Special.)—O. Burlingame, City Engineer, says that $80,000 will be expended on sewers this season.

Holland, Mich.—Plans are being prepared for a sewerage system by Alvord & Shields, the Rookery, Chicago.

Marlboro, Mass.—New filter beds will be constructed at the sewage disposal works. C. F. Bigelow, city engineer.

Concord, N. H.—A sewer will be constructed in the West End at an estimated cost of $20,000 or $25,000.

Memphis, Tenn.—The construction of about six miles of sewers to Goat Hill and South Memphis is contemplated.

Stoneham, Mass.—The issue of $130,000 in bonds has been authorized by the legislature for constructing a sewer system.

Newark, N. J.—Ordinances have been passed to a third reading for constructing sewers in Ogden, S. Eight and Pacific-sts.

Worcester, Mass.—A new sewer will be built in Highland-st. at a cost of $4,100, and one in Lagrange?st. at a cost of $1,000.

Burlington, Ia.—A petition for a sewer system on South Hill has been favorably reported by the sewer committee.

Boston, Mass.—The superintendent of streets has been authorized to expend $35,000 for outlet sewers in the South Boston district.

Paterson, N. J.—(Special.)—Thomas McLean, street commissioner, says that the only improvements contemplated now is the construction of some pipe sewers.

Oberlin, O.—A resolution has been passed for constructing sewers in a part of sewer district No. 11. Chas. S. Brown, Clerk.

Chester, Pa.—The residents of the borough of Prospect Park are circulating a petition asking for a system of sewers.

Sacramento, Cal.—An estimate has been made by the city surveyor on the cost of a sewerage system, which is $85,152.60.

Marion, Ind.—(Special.)—John Watts, city clerk, says that about 10 blocks of sewers, with laterals, will be put in this season.

Richmond, Ind.—Plans are being prepared for four sewage disposel beds for the insane asylum by H. L. Weber, city engineer.

Reading, Mass.—An appropriation of $800 has been recommended to employ an engineer to make surveys and prepare plans for a sewerage system. Earl H. Gowing, Chairman Com.

Beaver Falls, Pa.—The council will be asked to pass an ordinance for building a sewer on Sixth-st., from the Central hotel to Walnut run.

Lynn, Mass.—A petition has been sent to the legislature for authority to issue $115,000 in bonds for constructing sewers. Chas. W. Gay, City Engineer.

Alexandria, D. C.—The city council has been asked for a franchise to build a sewer in Fairfax-st., from Royal to the river, by a number of business men.

Rochester, Minn.—Plans will be prepared by W. C. Fraser, city engineer, for a sewer system in College and Main-sts. to connect with the Zumbro-st. sewer.

Bloomington, Ill.—(Special.)—W. P. Butler, city engineer, says that the pipe sewers under contract and to be let will amount to about three miles. The city will probably construct one mile of three and four-foot brick sewer.

Davenport, Ia.—The work will probably be taken up this summer of sewering the north end of the city from the eastern to the western city limits. The work of the main sewer will involve the expenditure of about $100,000. It will be about 4 miles long. Other sewer are being considered also.

Binghampton, N. Y.—(Special.)—H. Ward says that sewers proposed for this year are: Trunk sewer on Laurel-ave.; pipe, upper end of Laurel-ave., Butternut-st., Orchard alley, Washington, Eldredge, Emmett, Doubleday, South, Varick and Cherry-sts., and perhaps Chapman-st.

New Haven, Conn—The series of bonds issued several years, to the amount of $500,000, for the construction of new sewers, will be exhausted this year when the city will issue the last $100,000. The money will probably be spent entirely on sewers to be built this year.

Niagara Falls, Canada.—(Special.)—Charles H. Mitchell, city engineer, says: "We expect to build about $50,000 worth of our sewerage system during the present year. The total appropriation is $109,000. This year's work will consist in two outlets into the Niagara river gorge, consisting of shafts and tunnels in rock, together with wood stave outlets down the slope; about 2,500 feet of 3 by 4 brick sewer and about 3,000 feet 18-inch, about 6,000 feet 15 and 12-inch pipe, and about 7,000 feet of 8, 9 and 10-inch pipe. The plans and specifications are now almost completed and we hope to ask for tenders about the 25th of this month. The city has no other municipal improvements under contemplation this year, with the exception of the improvements to our water works intake, which will consist of special construction to provide against ice and low water just above the falls."

CONTRACTS AWARDED.

Wahpeton, N. D.—The contract for constructing the Sixth-st. sewer was awarded to Allen & Osgood of Fargo, N. D., for $1,173.26.

New York, N. Y.—Bart Dunn, 321 E. Sixty-eighth-st., presented the lowest bid —$49,840 April 11, for constructing a sewer in Kings Bridge road.

Medford, Mass.—T. H. Byrne & Co., Melrose, Mass., was awarded the contract for about three miles of pipe sewers in this city for $14,315.

New Brunswick, N. J.—T. H. Riddle has been awarded the contract for 1,550 feet of 10-inch pipe sewer at $1.04 per foot, man-holes $38, Ys 55 cents.

Toledo, O.—The bid of F. E. Cole was the lowest April 20 for a main sewer in Fassett-st. The bid was $3.15 for 4-foot and $2.68 for 3-foot sewers.

Hartford, Conn.—The contract for constructing the intercepting sewer was awarded April 8 to P. H. Harrison & Sons of Newark, N. J., for $213,802. There were fifteen other bids on the work.

Buffalo, N. Y.—The contract for constructing a sewer in Bryant-st and Ashland-ave. was awarded to John Harris for $4,500 April 2. The contract for a sewer in Niagara-st., from Breckenridge-st. to Auburn-ave. was awarded to August Gisel for $900.

Ft. Madison, Ia.—(Special.)—J. Ross Robertson, city engineer, says that the contract was awarded April 6 to the Ft. Madison construction company at the following prices: 18-inch pipe 48 cents; 12-inch pipe 30 cents; 10-inch pipe 30 cents. All pipe is to be furnished by the city.

Grand Rapids, Mich.—(Special.)—H. A. Collar, city engineer, says contracts have been awarded as follows: S. Pine-st., 9-inch pipe, $332.25; Michigan-st., 9-inch pipe, $225; Barclay-st. sewer, 9-inch pipe, $342; Maple-st., 9-inch pipe, $170.75.

CONTRACTS TO BE LET.

New Brunswick, N. J.—Bids will probably be asked in May for constructing sewers in two districts. Asher Atkinson, city engineer.

Muncie, Ind.—Sealed proposals will be received until May 4 for constructing sewers. Check, $50. F. A. Elrod, city clerk.

Dayton, O.—Sealed proposals will be received until May 5 for brick and pipe sewers. C. A. Herbig, city comptroller.

New York, N. Y.—Sealed proposals will be received until May 5 for constructing sewers in seven streets. Louis Haffen, 2622 Third-ave.

Stillwater, Minn.—Bids will be received until May 2 for constructing a branch sewer to the court house. Charles H. Brown, county auditor.

Alexandria, Va.—Sealed proposals will be received until May 11 for constructing a sewer on Pitt and King-sts. Check, $300. E. C. Dunn, city engineer.

Hackensack, N. J.—Sealed proposals will be received until May 4 for a sewer, part pipe and part brick, in Kansas-st. G. W. Conklin, secretary improvement commission.

Niagara Falls, Ont.—Sealed proposals will be received until May 13 for constructing sections Nos. 1 and 2 of the sewerage system. Bond, 40 per cent. Charles H. Mitchell, engineer.

Central Falls, R. I.—Sealed proposals will be received until May 4 for constructing 2,250 feet of twelve to four-inch pipe sewers for the sewerage disposal plant. N. Howard Easton, secretary B. P. W.

New Castle, Pa.—(Special.)—Sealed proposals will be received until May 4 for constructing a three and four-foot storm sewer on Grant-st., 3,150 feet. Frank Tidball, city clerk.

Chicago, Ill.—Sealed proposals will be received until May 4 for constructing sewers in sundry streets and avenues. Check, $3,000; also for laying private drains. Check, $500. W. D. Kent.

Clinton, Ia.—Sealed proposals will be received until May 5 for the construction of 970 lineal feet of twenty-four-inch pipe sewer. Certified check, $100. E. E. Forbes, county auditor.

St. Louis, Mo.—Sealed proposals will be received until May 5 for 2,100 feet of seventy-eight to twenty-four-inch brick sewer and about 13,000 feet of twenty-four to twelve-inch pipe sewers. Rober E. McMath, president B. P. I.

Collins, N. Y.—Sealed proposals will be received until May 5 for constructing a twenty-inch sewer, with appurtenances, for the Collins farm state homeopathic hospital. Plans and specifications on file at office of Guthrie & Rockwood, C. E., 98 Erie Bank building, Buffalo.

Buffalo, N. Y.—Sealed proposals will be received until May 5 for constructing an eighteen, fifteen and twelve-inch tile sewer in Columbus-ave.; a twenty-four-inch brick and a fifteen-inch tile sewer in Elk-st. Check, 50 per cent. R. G. Parsons.

Brunswick, Me.—Sealed proposals will be received until May 9 for constructing 3,000 lineal feet of eight-inch sewer, 9,200 feet six-inch sewers, 130 yards brick masonry in manholes, 12,000 cubic yards of excavation. Ernest W. Bowditch, 60 Devonshire-st., Boston, engineer.

Toledo, O.—Sealed proposals will be received until May 11 for constructing one twenty-inch cylindrical brick sewer and three two-foot cylindrical sewers. Check, $100. Proposals will be received until May 18, for a three-foot cylindrical brick. Check, $500. Lem P. Harris, city clerk.

Cleveland, O.—Sealed proposals will be received until May 6 for constructing sewers in Amos and Wilmars-sts., and in Giddings and Russell-aves. Check, $500. Proposals will be received until May 20 for a sewer in Union-st. with an overflow in Ackley-ave. Check, $5,000. D. E. Wright.

Wilkesbarre, Pa.—Sealed proposals will be received until May 8, for the excavation, pipe laying, back filling, etc., required in construction of such sewers as may be constructed during the present fiscal year. Also, for the supply and delivery of vitrified sewer pipe. Edward Wells, chairman, sewer committee.

Chicago, Ill.—Bids were opened April 24 for constructing the Forty-fifth-ave. sewer system. The proposed system is divided into five sections, and has been awarded as follows: Section A, Campbell, Dennis & Co., $172,981.60; section B, Farley & Green, sewer in the center, $165,-115.80, and F. J. Nichols, in the side of the street, $179,532.75, contract not yet awarded; section C, Connor & Hitt, $19,-055.80; section D, Farley & Green, $43,-292.38; section E, Connor & Hitt, $24,-680.87.

Mendota, Ill.—Sealed proposals will be received until May 4 for constructing a sewerage system of about eight and one-half miles, upon the streets, avenues and alleys of sewer district No. 1; 51,600 feet eighteen, fifeen, twelve, ten, eight and six-inch sewer pipe; 3,000 feet six, four-inch drain tile; 1,000 feet three-fourths-inch galvanized iron water pipe; eighty-three manholes; sixteen single flush tanks; three combined manholes and flush tanks, four double flush tanks, one triple flush tank. Iowa engineering company, Clinton, Ia., consulting engineers. George Holland, city clerk.

Washington, D. C.—The contract has been awarded to Alexander C. Chenoweth of New York City for constructing sewers as follows: 2¾x4⅛ feet, 460 lineal feet, $3.98; 2¼x3⅜ feet, 130 lineal feet, $3.59; 2x3 feet, 400 lineal feet, $3.23; 2¼x3⅜ feet, 840 lineal feet, $3.71; manholes, $25. The bids were opened March 31.

Boston, Mass.—Bids were received April 18 by the metropolitan sewerage commission for constructing sections 17 and 18 of the Neponset Valley system as follows: Jones & Meehan, Jamaica Plains, Mass., section 17 $34,237, section 18 $38,880; Quimby & Ferguson, South Boston, Mass., section 17 $33,319, section 18 $42,232; F. A. Snow, 13 Broad-st., Boston, Mass., section 17 $33,087; section 18 34,433; Troy Public Works, Troy, N. Y., section 17 $32,907, section 18 $33,820; George R. Newman & Co., Providence, R. I., section 17 $27,170, section 18 $36,742; J. P. O'Connell, Dorchester, Mass., section 18, $36,332; William T. Ross, Waltham, Mass., section 18, $27,-379.

Altoona, Pa.—(Special.)—The contract for the construction of under drains for the sewage disposal plant for the Fourth sewer district, for which bids were received March 27, was awarded to M. V. Orner for $5,229.11. The resolution awarding the contract, which was one of the last acts of the retiring council, was returned by Mayor Hoyer without his approval. The action of the common council was concurred in by the select council, however.

Milwaukee, Wis.—Sewer contracts have been awarded as follows: Rogers-st. and Washington-ave., 2,309 feet brick sewer, J. J. Crilly, $3.97 per foot, and 271 feet pipe sewer $1.50 per foot; Newberry-boulevard, 1,007 feet pipe sewer, R. J. Hickey, 88 cents; Western-ave., from Highland-boulevard to Watertown Plank road, 321 feet pipe sewer, Matthew Chybowski, $1.24 per foot; Keefe-ave., from Humboldt-ave. to Buffum-st., 2,309 feet brick sewer, William Forrestal, $4.04 per foot and 885 feet of pipe sewer $1.75 per foot.

Worcester, Mass.—Contracts for furnishing supplies for the local sewer department have been awarded as follows: Smith, Green & Co., city, lime, $5.50 per ton; cement, 99 cents per barrel for sewer work, 30 cents delivered in city for the Kent dam and $1.07 per barrel delivered at the dam; M. C. Gault, East Barrington, N. H., brick, $7.25 per thousand; Whitney & Co., Millbury, Mass., catch basin castings, 1 3-16 cents per pound, and manhole covers, $5.90 per set; Webb granite and construction company, catch basin stone, $$9.70 per set; E. B. Crane & Co., J. F. Bicknel, and William H. Sawyer, city, lumber, $18.50 per thousand.

WATER-WORKS.

CONTEMPLATED WORK.

Searsport, Me.—Surveys will be made for water works.

Jamestown, N. Y.—Mayor O. F. Price recommends municipal water works.

Laurens C. H., S. C.—The issue of $40,-000 in bonds for water works is contemplated.

Galesburg, Ill.—The air-lift water system was adopted April 20 and bids will be asked soon.

Elizabeth, N. J.—The city council recently appropriated $600 to engage a consulting engineer to improve the Elizabeth creek.

Flushing, Mich.—Bonds have been issued for completing the water works system and for an electric light plant.

White Sulphur Springs, Mont.—(Special.)—J. T. Anderson, recorder, says no water system or other public improvements are contemplated this season.

Hokah, Minn.—The village trustees have been directed to engage an expert to make estimates on a system of water works.

McKeesport, Pa.—The water commissioners decided April 9 to present a measure to the councils providing for the erection of a filtering plant.

Beresford, S. D.—Plans have been made and correspondence is solicited regarding the construction of a water works system, with stand pipe and mains.

Waltham, Mass.—An appropriation of $10,000 for water works construction has been unanimously adopted.

Fennimore, Wis.—A system of water works and electric lights will be put in by popular subscription under the management of C. N. Graham.

Livonia, N. Y.—Plans and surveys are being made for water works by J. F. Witmer of Buffalo, and the question will probably be voted on soon.

Edwardsville, Ill.—F. N. Raeder of St. Louis has been engaged to investigate and report on a suitable water supply. A system will probably be built in the near future.

Columbus, O.—The bill in the legislature, recommended by the board of public works, gives the city authority to issue $150,000 bonds for the improvement of the water works when such improvement is deemed necessary.

The construction of water works systems is contemplated at the following places: Hartland, Wis.; Holland Patent, N. Y.; Blockton, Ia.; Harley, Ia.; Stanton, Ia.; Hokah, Minn.; Emerson, Neb.; Wells River, Vt.; West Medway, Mass.; Dauphin, Pa.; Lester Prairie, Minn.; Centerville, Mich.; Stockton, Ill.; Mitchell, S. D., and Westport, Mo.

Philadelphia, Pa.—A canvass of the members of the councils has developed the fact that the ordinance to borrow $250,000 will probably be defeated, so an amendment will probably be made to

make the appropriation $50,000 for tests of plants and follow this up with a $1,000,000 loan bill for permanent plants.

CONTRACTS TO BE LET.

Howard Lake, Minn.—Bids will be received until May 18 for constructing a system of water works. Thomas R. Briggs, Village Recorder.

Glenville, O.—Bids are invited until May 13 for a supply of curb boxes and corporation cocks. Robert Foster, Secretary Trustees.

Ligonier, Pa.—The plans and specificationos will be ready about May 1 for the proposed water works system. J. W. Keffer.

Franklin, Ky.—Sealed proposals will be received until May 18 for the erection of a system of water works. S. N. Forline, Clerk.

Jersey City, N. J.—Bids will be received until May 18 for a daily water supply of 35,000,000 to 50,000,000 gallons. Cornelius C. Vermeule, 71 Broadway, New York City.

Cleveland, O.—Sealed proposals will be received until May 15 for building and placing in position in a tunnel under the Cuyahoga river about 740 feet of 48-inch riveted steel water pipe with cast iron chains and steel suspension beams. Check, $2,000. D. E. Wright.

Clifton, N. Y.—The contract for constructing the system of water works was awarded to G. D. Grannis of Syracuse for $45,000.

Evansville, Ind.—The contract for two 10,000-gallon pumping engines, with boilers, etc., was awarded the Holly manufacturing company for $122,250.

Camden, Pa. — Proposals have been opened for building a new artesian water plant, but the contract has not yet been awarded.

Glouster, O.—(Special.)—W. O. Carpenter, corporation clerk, says a franchise has been granted to J. E. Carpenter for a water works system.

Long Island City, N. Y.—A contract has been made with the Woodside water company to furnish 1,000,000 gallons a day, and 15,000,000 gallons if necessary.

Warren, Ill.—The lowest bids presented for constructing the water works system was that of Blake, Steuck & O'Farrell of Dubuque, $10,656 on the second proposition, and Thacher & Burke of Chicago $11,800 on the second proposition.

Toledo, O.—The contract for laying an auxiliary force main was awarded April 13 to R. N. Andrews of Hamilton, O., for $18,620. The work includes 14,400 lineal feet, 30-inch pipe and 204 feet of 24-inch pipe.

Cicero, Ind.—(Special.)—George J. Hall, town clerk, says a franchise has been granted a company, of which E. M. Hinshaw, cashier of the Merchants' bank, city, is president, for a water works and electric light system.

Nyack, N. Y.—The contract for putting in the water works system was awarded April 14 as follows: Pipe and specials, McNeal pipe and foundry company, Burlington, N. J., $27,755.04; labor, Joseph Gallo, New York, $8,163.23; valves, Rensselaer manufacturing company, $2,680; total, $38,568.27.

BRIDGES.

Traer, Ia.—An iron bridge is contemplated in North Geneseo.

Indianapolis, Ind.—A bridge has been asked for across Pleasant Run at Gatling-st.

Canton, S. D.—Petitions have been received by the Lincoln county board for twenty-five bridges.

Great Capacon, W. Va.—The erection of a county bridge across the Capacon river is being agitated.

Jefferson City, Mo.—The new steel bridge across the Missouri river will be formally opened in May.

Keyesport, Ill.—A proposition to build a wagon bridge across the Kaskaskia was carried April 22.

Falmouth, Me.—The iron bridge that was recently carried away by the flood will probably be replaced.

Cassville, Wis.—The project of building a high bridge over Furnace Branch has been favorably voted on.

Carnegie, Pa.—A petition is being circulated for a bridge at West Carnegie, across Charters creek.

Newville, Pa.—A new bridge has been recommended by the county commissioners, to be built at Big Spring.

Flandreau, S. D.—Bids are invited until May 4 for constructing a bridge. H. W. B. Souther, County Auditor.

Whately, Conn.—A sum, not exceeding $5,000, will be borrowed for the purpose of putting in iron bridges.

Del Norte, Col.—Five bridges have been destroyed by an ice jam, two of the bridges being county bridges.

St. Louis, Mo.—The house has passed a bill authorizing the construction of a third bridge across the Mississippi river.

Topeka, Kas.—Keepers & Thacher, Detroit, Mich., were awarded the contract for building the new Melan bridge for $135,000.

Vassar, Mich.—An 80-foot span bridge, iron superstructure and stone substructure, is contemplated across Cass river. T. Baughart.

Denver, Col.—A new steel bridge is contemplated across Cherry creek at Lawrence-st. by the board of public works.

Fort Madison, Ia.—The contract will be let June 1 for building all bridges for one year. J. Ross Robertson, County Engineer.

Knoxville, Tenn.—The bids for a bridge across the Tennessee river were rejected and new bids will be received May 4.

Iowa City, Ia.—A new bridge is contemplated across Cedar river at McClellands ferry site by the Johnson county board of supervisors.

Rochester, Minn.—Bids will probably be asked soon for building a bridge over the Zumbro river. S. O. Sanderson, County Auditor.

Lafayette, Ga.—Sealed proposals will be received until May 12 for building a steel bridge across Chickamauga creek. R. B. Neal, Commissioner.

South Berwick, Me.—The wrought iron bridge company, Canton, O., was awarded the contract for a new iron bridge to replace the one recently washed away for $2,841.

Seattle, Wash.—County Auditor Beman has been instructed to advertise for bids for a new bridge over the Tolt river, near Tolt.

Lincoln, Neb.—The wrought iron bridge company, Canton, O., secured the contract for all bridges to be constructed during the year.

Oregon, Ill.—A new iron bridge across Rock river has been recommended by a committee of the board of supervisors for this place.

Clearwater, Kas.—Plans have been submitted for an iron bridge across the Ninnescah river at Nickerson's ford near this place. Estimated cost, $4,700.

Kennebunkport, Me.—A new iron bridge with stone abutments has been unanimously voted for. Bonds to the amount of $75,000 will be issued.

Hartford, Conn.—The contract for a new temporary bridge across the Connecticut river was awarded to the Berlin iron bridge company for $37,000.

Litchfield, Minn.—Bids are asked until May 6 for constructing a bridge over Crow river in Union township. I. J. Anderson, Chairman Supervisors.

Brookings, S. D.—The bridge across the Sioux river has been condemned and a new one will be built as soon as possible.

Middletown, O.—A bill has been introduced in the legislature which provides for a bridge on Third-st. across the Miami and Erie canal.

Salisbury, N. C.—A company has been formed to build an iron bridge across the Yadkin river in Rowan county. John S. Henderson is interested.

Newark, N. J.—A resolution has been adopted for a bridge from the foot of Fourth-st., Harrison, to the foot of Madison-st., this city.

Grand Forks, N. D.—Sealed proposals will be received until May 11 for constructing any or all bridges to be built during 1886. J. W. Scott, Auditor.

Lewistown, Me.—The contract for a steel bridge across the Androscoggin was awarded April 17 to the Edgemoor bridge works of Wilmington, Del., for $45,940.

Milford, Kas.—The contract for an iron bridge 400 feet long was awarded to the Missouri Valley bridge company at $6,885. There were fifteen bidders.

Atlanta, Ga.—Sealed proposals will be received until May 6 for building a bridge over Peachtree road, about five miles from this city.

Harrodsburg, Ky.—Sealed bids will be received until May 4 for the construction of 100-pound steel bridge across Chaplin river about one mile east of Dixville.

Fairview Kas.—The iron bridge across the Grasshopper, about one mile south of the Missouri, was destroyed recently by a tree which was being cut down near it falling across it and breaking it down, and a new one may be required to replace it.

Denver, Col.—The contract for the Morgan county state bridge over the South Platte at Orchard was awarded to F. E. Barker of Fort Morgan for $2,725. The next lowest bid was submitted by the Wrought iron bridge company of Canton, O., $2,895.

Duluth, Minn.—Bids will be received until May 5 for a steel highway bridge over the railway tracks at Short Line park. Check, $500. O. Halden, County Auditor.

Auburn, Me.—The contract for a new steel bridge across the Little Androscoggin river at Oaks crossing was awarded to the Variety iron works of Columbus, O., for $2,420.

Bryan, Tex.—Sealed proposals will be received until May 15 for constructing a highway bridge across the Brazos river. Certified check, $1,000. G. S. Parker, Secretary Brazos River Bridge Company.

Vermillion, S. D.—Bids will be received until May 4 for building a bridge across Ash creek, two 2-34-foot bridges and one 48-foot bridge. Frederick Heglin, County Auditor.

Paterson, N. J.—Sealed proposals will be received until May 4 for the erection of a concrete and steel bridge (Melan system) across the Passaic river, West-st. Certified check, $5,000. Arthur B. Pearce, Clerk.

Richmond, Ind.—Bids are asked until May 18 for a steel highway bridge 635 feet long. Plans can be obtained of City Engineer Weber at a cost of $5. Alonzo Marshall, County Auditor.

Easton, Pa.—The Wrought iron bridge company, Canton, O., was awarded the contract March 20 for constructing a steel highway bridge across the Bushkill at Tatamy, Pa., for $9,567. There were eight bids.

Rock Valley, Ia.—The supervisors of Sioux county, Iowa, and Lincoln county, South Dakota, will meet at Elm Springs, Ia., May 20 to consider the erection of a bridge at that place across the Sioux river.

St. Paul, Minn.—Sealed proposals will be received until May 4 for the construction of an arch stone culvert on White Bear-ave., near the city limits. Bond, $500. Robert A. Smith, Chairman of the Board of County Commissioners.

Booneville, Mo.—A high bridge with combination spans or a low bridge with pivot draw is contemplated across the Missouri river to accommodate foot passengers, wagons and street cars and to connect Cooper and Howard counties.

Philadelphia, Pa.—Sealed proposals will be received until May 12 for work appurtenant to the abolishment of all grade crossings on the line of Pennsylvania-ave. and Noble-st., including ventilating conduits, retaining walls, bridges, etc. Thomas M. Thompson, Director.

Seattle, Wash.—Bids will be received until May 4 for building a 90-foot bridge span, a "sheer" dam, shore protection at south end of bridge, straightening river channel, building earthen approaches at south end of bridge. Nathan Beman, Clerk County Commissioners.

Cincinnati, O.—A bill has been passed in the house authorizing the Hamilton county commissioners to issue bonds to the amount of $120,000 to build two iron bridges, one across the Miami river at Newton and one across the Mill race near Indian station.

La Salle, Ill.—Sealed proposals will be received until May 5 for building a high-

way bridge across the Big Vermillion river as follows: Main span, 200 feet; one end span, 50 feet; each span to be 18 feet wide; also two cylinder piers 5 feet in diameter each filled with concrete made of Portland cement; also the construction of end abutments, etc. Certified check, $200. J. E. O'Halloran, Clerk. John Ferguson, Chairman Joint Committee.

Taunton, Mass. — (Special.) — Luther Dean says the lowest bid for a steel girder bridge over Mill river at Washington-st., received April 14, was from the Norton iron company, East Everett, Mass., $5,255.

PARKS.

Decatur, Ill.—The park commissioners contemplate improving the parks.

Boston, Mass.—An appropriation of $1,000,000 for park improvement purposes has been made.

Rockford, Ill.—The purchase of the fair grounds is suggested, to be converted into a public park.

Cambridge, Mass.—The park department is improving the old Broadway common. About $5,000 will be expended upon it.

Aledo, Ill.—The press is agitating the improvement of the vacant square in front of the court house.

Toledo, O.—The park commissioners have asked for authority to borrow $25,000 to maintain and improve the parks this summer.

Alton, Ill.—A tract of land of sixteen acres has been purchased by the Alton railway and illuminating company for park purposes.

Turner, Kas.—A macadam boulevard is contemplated from the western city limits of Argentine to the Turner bridge, a distance of about three miles.

Winona, Minn.—An ordinance has been submitted to council asking that the levee tracks be moved further south on Front-st. to make room for the levee park.

New York, N. Y.—A site bounded by Houston, Sheriff, Pitt and Stanton-sts. has been selected for the East Side park. The West Side park has not yet been decided upon.

Danville, Ill.—The Driving club is promoting a scheme for rebuilding Gilbert-st. for driving purposes, with the adoption of rules to govern traffic which will make it virtually a boulevard.

Scranton, Pa.—A resolution has been approved requesting the park commissioners to ascertain if the land in the neighborhood of the burnt bridge dam can be secured for a public park.

Somerville, Mass.—An order has been passed authorizing the mayor to petition the legislature to allow the city to borrow $50,000 outside the funded debt to acquire and to convert into a park Sanborn field.

Erie, Pa.—Cascade park will be improved. A main brick sewer will be built and the street now running through the center of the park will be closed. The park will be twice as large as the present city parks.

Newark, N. J.—About fifty acres of ground has been purchased between Fifth-ave. and Lake-st., Bloomfield-ave. and the Morris and Essex canal for the extension of Branch Brook park. The buildings, seventy-five in all, must be removed by May 20.

Davenport, Ia. — Riverside terrace, Prospect park, Central park and Washington and Lafayette squares are being improved. The assurance of funds has stimulated the work and for the next five years, the period over which the park tax extends, the work of beautifying them will be kept up.

Des Moines, Ia.—The residents of Kingman-ave. are desirous of converting the street into a boulevard. They propose to turn it over to the park commissioners if they will accept it and in the course of time allow it to become a part of the city park system.

Memphis, Tenn.—Col. A. M. Billings of the Citizens' street railway has become the owner of about 500 acres of land located just east of Raleigh, which he will transform into a vast park, making it one of the finest parks in any of the southern cities.

New Orleans, La.—A gardener has canvassed the city, meeting with success, who proposes to beautify St. Charles-ave. by cutting the grass near the tracks short, making beds in the shape of stars and crescents and planting pretty plants in front of each house for $1 per month for each residence.

New York, N. Y.—A resolution has been unanimously adopted to introduce, for immediate enactment in the legislature, a measure providing for the appointment of a commission to prepare a map showing the public highways, parks and sewer systems of Staten Island and prohibiting any further construction of such works pending the completion of the commission's labor.

Cincinnati O.—An ordinance will be introduced which will provide for handsome boulevards in the prospective suburban portions of the city. The object of the ordinance is to accept no dedication of lands for streets which is not with a view of making the thoroughfare fifty feet between the curbs, which, with a 16-foot sidewalk on each side, would make a street eighty-two feet wide.

San Francisco, Cal.—An effort is being made to transform Dolores-st. into a boulevard by having a space seven feet wide in the middle of the road set apart for foliage and planting a double row of trees for shade; outside of the curb a smooth track six feet wide for the use of wheelman; gutters to be laid outside of the bicycle path; the sidewalks to be eighteen feet wide and the street to be bitumenized.

St. Paul, Minn.—An ordinance has been introduced at the request of the park board to establish rules for the government of parks and parkways. Also a resolution requesting that all plats upon which all land is dedicated for park purposes be referred to the board before being finally approved. Referred to the street committee.

STREET SPRINKLING.

Somerville, Mass.—An order has been adopted providing for the purchase of a watering cart.

Lowell, Mass.—A street committee made a recent visit to Worcester and Boston to examine street sprinklers.

Centerville, Ia.—The purchase of a street sprinkler of the latest design and holding 600 gallons of water is proposed by George Strickler.

Haverhill, Mass.—Differences that have arisen between the committee on street sprinkling and the Worcester company relative to sprinkling threaten to break the contract.

St. Augustine, Fla.—The purchase of a street sprinkler will be considered. The city has heretofore rented a sprinkler at $15 per month, but thinks to purchase one will be cheaper than renting.

Salem, Mass.—The contract for sprinkling the streets has been awarded to Hamlin & Williams and James Welsh, jr.

New Haven, Conn.—An ordinance has been approved which provides that street sprinkling shall be done between March 15 and Nov. 15, the contracts to be let by the board of public works, and the contracts not to be made for a longer period that three years. There shall be a superintendent of street sprinkling at a salary of $1,000 a year.

St. George, N. Y.—A new rule for sprinkling the streets has been put into effect this season, which is to first sprinkle one side of a street its whole length, or within a certain distance, and then make the return trip on the other side, so that at all times one-half of the road may be in a condition to permit cyclists to ride over it with safety. It is hoped that the Staten Island electric railroad company will purchase its own sprinklers.

STREET CLEANING.

Utica, N. Y.—The contract for removing ashes and rubbish for the year was awarded to Joseph N. Corrigan, for $7,000, April 17.

Chester, Pa.—The street committee of council in its report says the action of the council in purchasing a street sweeper and street sprinkler has enabled the committee to sweep all the streets thirteen times during the year.

Chicago, Ill.—Bids have been received for sweeping the outer portion of the city, which was divided into three districts for the purpose of bidding, north, west and south sections. The bids received were as follows: John S. Cooper, $30 a mile for each district; James H. Burke, $28.50 a mile for each district; W. J. Moxley, jr., $27 a mile for each district; Otto Fischer, $22 a mile for north district; Thomas Fox, $27.25 a mile for south division. Mayor Swift and Commissioner Kent will take up the matter together. The mayor said the machines will be bought by the city and the city will do the work. The contract for the first district was awarded to Schendorf & Bussey.

Brooklyn, N. Y.—Proposals were opened April 21 as follows: John H. O'Rourke, cleaning streets, $23 per mile; removing ashes first year, $240,000; second year, $245,000; third year, $250,000; John O'Grady and Hugh S. Blake, cleaning streets, $17.50 per mile; removing ashes first year, $230,000; second year, $250,000; third year, $275,000. Cranford & Co., cleaning streets, $19.90 per mile; removing ashes first year, $240,000; second year, $250,000; third year, $255,000. Daniel J. Creen, cleaning streets, $23.25; removing ashes first year, $247,000; second year, $250,000; third year, $257,000. S. W. McKeever, cleaning streets, $17 per mile; removing ashes first year, $220,000; second year, $229,000; third year, $247,000. J. W. Tumbridge, cleaning streets, $20 per mile; removing ashes per year, $215,000. James Dunn and Joseph A. McGarry, cleaning streets, $17 per mile; removing ashes first year, $210,000; second year, $225,000; third year, $230,000. Thomas Frazin, cleaning streets, $18 per mile; removing ashes first year, $210,000; second year, $230,000; third year, $245,000.

GARBAGE DISPOSAL.

Des Moines, Ia.—The purchase of a new garbage crematory is being considered by the council.

Mankato, Minn.—The construction of a garbage crematory is favored by Health Officer Jacoby.

Burlington, Ia.—The advertising for bids for gathering and disposing or garbage during the summer has been authorized.

Niagara Falls, N. Y.—The contract for building a steel garbage chute was awarded to John Maher of Tonawanda, for $1,040.60. The Oliver Buleson hardware company, city, bid $1,180, and Dobbie & Stewart, city, bid $1,100.

Syracuse, N. Y.—The contract for garbage, awarded to Dailey & Aldrich, by the board of health, has not yet been approved by the common council. The contract calls for the erection of two crematories, one on each side of the Erie canal.

Orange, N. J.—The special committee, appointed more than two months ago, to investigate the subject of a garbage crematory to be built and used jointly by the Oranges and Montclair, reported that after communicating with officials in all of the large cities of the United States and many in England, the committee had not been able to find any method for disposing of garbage that it could recommend as practical or perfect, and suggested that no action be taken in the matter.

Chicago, Ill.—Bids received for the removal of dead animals were as follows: James Haw, $24,000 one year, $50,000 five years; James L. Tracey, $18,200 one year, $45,500 five years; Thomas Fox, $22,500 one year and an offer to pay the city $350 a year for privilege of the contract for five years, if permitted to erect a rendering establishment within the city limits; Union Rendering Company, $25,000 one year, $37,500 five years; Albert Bogenbold, $12,500 one year and will give the city $400 a year for five years' contract if permitted to erect a rendering establishment. No action has been taken on the bids.